RECOMMENDATIONS.

From the (London) Eclectic Review.

" To Surgeons who have had little opportunity of exercising their judgment in cases that require decisive and difficult measures, and indeed to all young practitioners, such a work as Mr. *Bell's* will be a valuable acquisition. They may consider it as performing the functions of a skilful companion, attending them to the scene of operation, ready to direct their judgments, and guide their hands, in most of the perplexities to which they may be reduced.

" The instructions are generally accompanied by copious and judicious illustrations in the text, and in the numerous excellent Plates; and they are confirmed by rational deductions from the anatomy of the parts."

* * * * * * * * * * * * * * *

From Dr. Solomon Everist, of Canton (Conn.)

Canton, July 24th, 1811.

Gentlemen—I have perused a *System of Operative Surgery*, by *Charles Bell*; and consider it the most valuable work of the kind extant. I think his reasonings are generally just, and his directions are rational and intelligible.

I learn with much satisfaction your intention to publish an American Edition of this excellent work; and doubt not you will meet with encouragement from the scientific part of the profession.

I am with sentiments of esteem and respect,

Your obedient humble servant,

SOLOMON EVERIST.

Messrs. Hale & Hosmer, Hartford.

* * * * * * * * * * * * * * *

From David Hosack, M. D. Professor of the Theory and Practice of Physic and Clinical Medicine, in the New-York College of Physicians and Surgeons.

New-York, September 3d, 1811.

Messrs. Hale & Hosmer,

Gentlemen—It gives me great pleasure to learn your intentions of re-publishing the *Operative Surgery* of *Charles Bell*. It is certainly a work of great merit, and should be in the hands of every operator, as well as the student of Medicine and Surgery.

I am, gentlemen, with every wish for your success,

Respectfully yours,

DAVID HOSACK.

* * * * * * * * * * * * * * *

From Nathan Smith, M. D. Professor of Surgery and Materia Medica, in Dartmouth College.

Hanover, November 20th, 1811.

From an attentive perusal of Mr. *Charles Bell's Operative Surgery*, I feel authorized to give it a decided preference to every other work of the kind, which has fallen under my observation.

The practical illustrations are copious, and selected with careful attention, and judicious discrimination, from a wide field of personal experience and observation.

The style is interesting, familiar, and impressive. The descriptions clear, concise, and energetic. The operations are performed according to the most modern and improved modes of Surgical Practice. Many of the improvements are peculiar to this work; being the fruits of an industrious life, uncommon sagacity, and minute investigation. In short, the merits of the work are so obvious and numerous, that the perusal must ensure the approbation of every surgical practitioner.

NATHAN SMITH.

Messrs. Hale & Hosmer.

From Dr. Mason F. Cogswell, of Hartford (Conn.)

Hartford, January, 1812.

Messrs. Hale & Hosmer,

Gentlemen—It is with pleasure I comply with your request in giving my opinion of *Charles Bell's Operative Surgery*, which you are about re-publishing. I have no hesitation in pronouncing it the best work of its kind that I have ever read. Its most distinguished excellence, however, in my opinion, consists, in rendering plain and intelligible, the most difficult parts of those operations which have hitherto been at best imperfectly understood.

MASON F. COGSWELL.

.....

From John Warren, M. D. Professor of Anatomy and Surgery, at Cambridge University, and John C. Warren, M. D. adjunct Professor of the above branches at the same place.

Boston, March 30th, 1812.

The subscribers are of opinion that *Bell's Operative Surgery* possesses some peculiar merits as a practical Work, and that its re-publication in this Country will be highly useful to the profession. They therefore very cordially concur with other gentlemen in recommending it to practitioners of Surgery.

JOHN WARREN,
JOHN C. WARREN.

.....

From Thomas Hubbard, M. D. of Pomfret (Conn.)

Pomfret, May 19th, 1812.

Messrs. Hale & Hosmer,

I learn with pleasure that you are re-publishing *Charles Bell's Operative Surgery.* I think it a most excellent Work, and calculated to be of great utility to the medical profession.

THOMAS HUBBARD.

.....

From Dr. Daniel Sheldon, of Litchfield (Conn.)

Hartford, July 27th, 1812.

Messrs. Hale & Hosmer being engaged in re-publishing *Charles Bell's System of Operative Surgery*, have requested my opinion of the same. Can say, that I consider it a Work of great merit, calculated not only for the improvement of the young practitioner in the science, but as a book of reference it is at least equal, if not superior to any thing of the kind I have seen.

DANIEL SHELDON.

A

SYSTEM

OF

OPERATIVE SURGERY,

FOUNDED ON

THE BASIS OF ANATOMY.

BY CHARLES BELL,

Surgeon of the Middlesex Hospital; Fellow of the Royal Society, and of the Royal College of Surgeons, of Edinburgh; Member of the Royal College of Surgeons of London; Associate of other Learned Bodies; and Reader of Anatomy in the Chair of Dr. Hunter.

IN TWO VOLUMES.

VOL. I.

THE SECOND AMERICAN, FROM THE LAST LONDON EDITION.

HARTFORD:

PRINTED BY GEORGE GOODWIN AND SONS.

1816.

PREFACE.

WHEN a Surgeon first takes the knife in his hand, and is preparing, with oppressive feelings, to perform an operation which may terminate the life of his patient, he is not always aware of what is the most difficult to be accomplished. His ideas are vague; his mind not settled to what he is to expect; the circumstances which ought chiefly to engage him are not distinctly before him; and no man has ever performed this painful duty, without feeling that it is in the very course of the operation that he learns what it is most necessary for him to know and to practise. For myself, I confess, that it is only by reflecting on the doubts which have crossed my mind during the operation; by taking note of the ideas which crowd into my recollection when it is over: and by thus contemplating the subject in a light purely practical, that I have been encouraged in the hope of making this book useful to the profession, and that I have been able to compress it into so small a compass.

The reader will find that I have not attempted to impose upon him the notion, that this is a complete system by setting up in array a fair arrange-

ment of Titles. This book is limited in its aim. I consider the student, while in the Lecture Room, in the Dissecting Room, and in the Hospital, as having attained a knowledge of Anatomy and of the Doctrines and Practice of Surgery. That is knowledge which cannot be comprised in two small volumes, nor explained in any books at all: it is to be acquired only by continual exercise, by daily and careful observation, by treasuring up the lessons which the passing occurrences of the Dissecting Room and Hospital suggest to his own mind, or draw from his teachers. But while I acknowledge this, and wish to inculcate it, I think that there ought to be a book in the hands of the pupil to direct him in his studies; to be associated with all he sees and hears; in which the lessons he has detailed to him at length by his teachers may be found more shortly expressed; to which, as a student, he can recur for a concise exposition of the points material in practice; to which, as a surgeon, he can turn for the detail of what is necessary to be done in preparing for an operation and in operating, unembarrassed by useless disquisition.

Every surgeon on the eve of a great operation ought to bring his judgment maturely to bear on all the points of the case; the objects to be attained; the dangers to be expected; the resources which he ought to have in readiness against probable mischance. And he cannot do his duty to his patient or to his own reputation, without arranging the probable occurrences in his mind, that

by anticipating he may avoid embarrassment, maintain his self-possession undisturbed, and save himself from the distraction of consultation and whispering during the crisis of his patient's fate.

It is to aid the young surgeon in entering into this communing with himself that I have offered these volumes to the profession.

That a design so obviously useful has not before been executed is surprising. Since the first appearance of this work several others have been announced, which had they preceded mine would have left me to follow other and more agreeable pursuits.

It is at all times a heavy task to compose a system, and the labour never yet was repaid by reputation, or otherwise. To those who know my situation and pursuits I shall not appear to arrogate much when I say, that I might have been more profitably employed; but I felt it to be a duty to my pupils to prepare for them the present work, and I must not regret the time that has been employed on it.

London, 34, *Soho-Square*,
1*st October*, 1814.

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INTRODUCTION,

CONTAINING

SOME HINTS TO THE STUDENT OF SURGERY,

TOUCHING THE CHANGES CONSEQUENT ON WOUNDS,

And intended to keep his attention alive to the more common occurrences of practice in the Hospital.

DISTINCTIONS arise in the nature of wounds, 1st, From the instrument, and the degree of force with which the injury is inflicted; and, 2dly, From the part which is struck.

When a great weight falls on a man, and bruises without cutting; or if he has been struck on a fleshy part with a mallet, or with a brick-bat; or if he has been thrown from his horse, and has hurt a fleshy part; the effects are these; a bruising of the soft parts, an injury and benumbing of the nerves, and a rupture of the lesser blood-vessels of the part, which produces an ecchymosis, or extravasation of blood into the cellular membrane.

Even in this wound, there are circumstances which a careless observer may overlook. To the

full effect of a blow it is necessary that the resistance should be equal to the velocity of the impelled instrument; but where the parts yield, the shock is diminished, and the injury is less considerable. Now, the integuments being soft and elastic, while the bone is firm and resisting, the injury sometimes falls upon the soft parts immediately attached to the bone. The consequence of this is, that concealed suppuration arises from bruises of fleshy parts, in which there appears little outward mark of injury. A boy, while lying asleep on the ground, was trod upon by the foot of a fellow with coarse wooden shoes. I saw the boy some days afterwards. With excruciating pain, followed by shivering and fever, the thigh had become enormously swelled, but not in the slightest degree discoloured. The swelling was tense and elastic; very like the mere tumefaction of the inflamed muscles bound down by the fascia. Imagining that matter might be forming under the fascia, I made a puncture into it, but no matter flowed. Still suspecting what had happened, I pushed an abscess-lancet deep into the wound, and made it grate upon the bone, when the matter appeared. I then introduced a catheter, and afterwards a silver tube, by which I completely emptied the thigh of that matter which had been formed in consequence of the injury of the soft parts contiguous to the bone. I knew by experience, (having only a few days before seen the dissection of a man who died in consequence of a blow with a mallet, on the forepart of the thigh,) that the thigh bone would

quickly have become carious. Had this deep abscess on the bone and amongst the muscles been laid open by incision, the boy could not have survived; the inflammation which would have followed must have destroyed him.

Large stones thrown with great force; spent cannon balls; the beam of machinery in full motion, striking a limb,—are sometimes attended with little pain, swelling, or discolouration; and gangrene precedes high action. It is the same effect which we more commonly see when a man lies with a bad concussion of the brain, and bruise of the scalp. The low state of the system, proceeding from the injury of the brain, prevents the inflammation or swelling from rising sufficiently to shew us the place of the injury.

If the patient has suffered contusion by falling, the first effect is a shock to the whole body; and there is sickness, languor, faintness, and debility: then succeed pain, stiffness, and fever. The part injured swells slowly; and from the ecchymosis there is marbled, black and purple colours. Towards the fourth and fifth day, there is softness in the centre, and around it a hardened ring of inflammation rises. This softness in the centre might be mistaken for suppuration, and a collection of pus: but it is only the extravasated blood diluted with serous exudation; and if the tumour be punctured, the wound will not heal kindly.*

* It is very important to observe this harder ring and soft centre in contusions of the head. The soft centre has often been taken for a depression of the skull, and the scalp cut open.

If the injury is not very severe ; if no parts are deadened by the bruise, and the extravasation is not very great,—then the vessels throw out a serous effusion, which diluting the extravasated blood, both are re-absorbed. It is this liquid state of the effusion which resembles suppuration.

If the excitement of the vessels be continued after this exudation of serum, the secretion from them changes to purulent matter ; and the centre of the cellular membrane, with the skin above it, is absorbed. This stage is marked by the fever, increase of swelling, heat, and redness, and to the throbbing, succeeds a pricking pain, and there is pointing or rising of the centre of the abscess. If the injury of the part be very great ; if there does not appear to be tumefaction in a degree natural to the injury ; and if we fear gangrene before the parts recover themselves, or if we have any alarms on account of the constitution of the man, (perhaps a debauchee, or a dissolute, drunken fellow, who has fallen from his cart ;) then we use flannel, with hot and spirituous fomentations. If in the parts an undue action has arisen, and we wish to soothe and moderate it, then we must use leeches, cold cloths, and cold spirituous applications, which excite the surface gently, and at the same time take off the heat by evaporation. Lastly, if suppuration be begun, and we wish to induce a healthy action, and to bring the matter to the surface, we must confine the heat by hot poultices, and make them more stimulating by adding some acrid ingredient.

Sometimes the shreds of cellular membrane are deadened by the bruise, or the high inflammatory action terminates in the death of some part of it. Then a *slough* is seen in the centre of the abscess when it bursts. This slough is not to be taken away, unless it confines the matter, or is likely to become putrid: the living parts will be excited by the contact of the dead; the living part will consolidate, ulcerate, and forming granulations, separate from the slough and leave it loose.

When the skin is bruised, and the blood extravasated under it, the parts sometimes mortify: but this mortification is of a less dangerous kind, because it does not arise from the state of the constitution.

The *sabre wound* forms a good distinction in wounds; for this kind of wound necessarily, from the curve of the sword, is of a simple form. The wound is simple in another sense. It bleeds freely; what is injured is seen, and when the swelling and inflammation arise, and the suppuration is formed, there is no binding of the flesh, and no internal mischief; the parts open, and the matter is freely discharged. Ligatures and the use of the needle are very seldom necessary. It is better to bring the lips of a wound together by adhesive straps and then lay compresses longitudinally on the sides of the wound, in a manner to make the roller act on the bottom of the wound. On occasion of a wound, that might have been cured easily by an adhesive strap, or the uniting bandage, I have seen the surgeon very alert with his needle. This

is quite wrong, and exposes the surgeon to a very unpleasant imputation: it is making a surgical case out of nothing.

If there be a cut in the fleshy part of a limb, still there is no necessity for bringing the sides of it together by ligatures. If the cut is in the course of the fibre of the muscle, the wound will not gape; if it be made across the muscular fibre, it is best managed by bringing the limb into a posture of ease, and relaxing the muscle.

In loose and moveable parts, as in the cheek and lips, ligatures or the twisted suture are absolutely required. In the belly, too, the suture is necessary. But in the scalp, the needle is not to be used; the uniting bandage, and soft elastic compress, answering every purpose, where the hair growing from the scalp has made it difficult to bring the wound together by the adhesive straps.

When the needle and ligature is used to draw the lips of a wound together, we make the interrupted suture. We must either support the integuments from being cut upon the ligature, by adhesive straps in the interstices, or lay compresses on the sides of the wound, and over these apply the roller or bandage.

It is by these means that we prevent the filling of the deep part of the wound with blood. Notwithstanding the arguments for the vitality of the blood, (and these I am far from contradicting,) the fact is, that if we negligently allow the blood to lodge in the wound, there will be suppuration afterwards.

In wounds, as in ulcers, it will often be essentially necessary to support them by an elastic roller. But much pressure irritates; and I have seen it, when very great (as in the attempt to suppress the hæmorrhagy) produce gangrene in the wound.

When we wish the lips of the wound to heal, so that there shall be no unsightly scar or contraction, success depends upon the neatness with which the edges are brought together; and we must be careful that they be not turned inward. After the operation, we must keep the parts very dry, and promote the formation of a scab from the oozing of the secretion. If there is a little fretting, we may pick and lift a part of the scab, to allow the collected matter to flow, and squeezing the wound gently, evacuate it, rather than by this accident lose all our hopes of union.

A wound with a small sword or bayonet runs deep, but makes no large outward opening. These are often complicated wounds, from taking their course among blood-vessels, and entering the cavities or joints. But even considered independently of these risks, they are not without danger; for as they run under the fascia without cutting it, they produce deep and of course general swelling of the limb, which from the binding of the fascia occasions great pain, with tension, and contractions.

After this high inflammation, there comes deep suppuration, with sinuses running amongst the muscles, destroying the connecting cellular membrane, and requiring counter openings for their cure. The discharge is not of the consistence of

cream, yellowish, and without fœtor, which is the character of *pus*, and such as flows from an open and healthy wound. For the treatment of these penetrating wounds, great judgment and knowledge of anatomy are particularly necessary.

The circumstance chiefly to be attended to in these deep wounds of the limbs is the strength and connexions of the fascia, or tendinous expansions, which cover the limbs; and with this view I would desire the student to consider very fully the anatomy of the muscles and fascia. For example, if a man has received a thrust through the back of the arm (the triceps;) or through the back and inside of the thigh; or through the flesh of the shoulder; there is ample room for the swelling which proceeds from this penetrating wound: and there will not be the great pain in the first instance, nor the subsequent confinement of matter, tension, and distress, which arise from a wound of the same nature passing up the fore-arm, or on the outside of the hip-joint, and under the great fascia of the thigh or leg. Thus, in the cure of every wound, in order to have a thorough understanding of the nature of the injury, and to form a true prognostic, we must combine the knowledge of the course and form of the wound, with a knowledge of the structure of the parts through which it takes its course.

In a puncture by a needle, a nail, a splinter of wood, a bone, &c., there is little or no cutting; the flesh and fibres are not divided, but merely separated. The injury in this case may fall on

the nervous system producing tetanus; or in bad constitutions there may arise, from an apparently trifling wound of this kind, a very high and dangerous inflammation attended with fever. The limb swells enormously, and the tendinous sheaths have an exudation in them which often leaves stiffness and contractions.

A puncture is particularly apt to affect the lymphatic system. There is a dark inflammation around the wound; a red line is perceptible, taking its course towards the next lymphatic gland; the gland swells and becomes tender, and fever and irritation pervade the whole system. Such is the wound from the dissecting hook. Such also is frequently the effect of exposing sores on the hand to the fluids of a putrid body. In the latter case, I have found it very efficacious to wash the irritable surface with a weak solution of caustic: to check the inflammation, we apply spirits and water to the hand and arm; but if it be not soon stopped we must foment, and clear the bowels, and give afterwards an opiate with warm wine.

Pins or small splinters of wood running under the nails produce extreme pain, and not unfrequently such violent inflammation in the sheath and under the tendons of the fingers, as to destroy the bone. If matter be discovered, the finger is to be cut with a knife to the bone, and a cloth wet in spirits and water put on the whole arm from the finger to the shoulder. This quickly subdues the inflammation, which is only violent but has nothing malignant: whereas by poulticing, dressing, and puncturing, the finger is lost.

That wound is called a larcerated wound which a man receives when he falls on a stake, and the parts are torn up; or when gored by a bull, the horns entering the flesh, and tearing up the muscles and tendons; or when a limb or part is torn off by machinery. The most striking peculiarity of this kind of wound is, that it does not bleed; which is thus explained: The injury consists not in the mere separation of the parts, as in a cut, but in the stretching and laceration which injures also the surrounding parts, and does not leave a fibre, vessel, or nerve, uninjured for some extent around. The nerves are injured, and the sensation becomes dull; the arteries are paralysed and cease to act, and as in dead parts, the blood settles and stagnates in them. The same effect is produced in any wound, where an exposed surface is bruised. Both these kinds of wounds are on this account apt to resist a healthy action, and in that case the swelling is slight and general; the edges of the wound loose; the patient restless, and disturbed, and perhaps delirious; and the parts instead of suppurating, become black and dry; then there is a danger of gangrene, spasm, or locked jaw.

The tearing and exposure of tendons and tendinous sheaths is almost peculiar to lacerated wounds. Where these parts are cut, they shrink and are buried; but in lacerations they are often torn out and lie relaxed. In the wounds and exposure of tendons and tendinous sheaths, there is a peculiarity. They neither bleed nor suppurate readily; and therefore probably it is that they

produce dry and irritable wounds. Not being dead, and yet not prone to that degree of inflammatory action which is the natural consequence of the wound of a vascular part in a healthy body, their exposure is followed by untoward symptoms. The edges of the wound are hard and irritable; the discharge is gleety; and a dangerous spasmodic state of the system is apt to prevail.*

Another distinction is the *penetrating wound*, which is, that in which the instrument opens a cavity and breaks the continuity of an extensive, investing, or lining membrane. Thus a wound of the abdomen, or thorax, or pericardium, or knee joint, is both peculiar and complicated; peculiar, in as far as the danger does not arise from the extent of the wound, but from the extent of the membrane, which may partake of the inflammation; and peculiar, in as much as the nature of the membrane injured, or the viscera exposed to inflammation, may produce a result very different from that of a simple wound.

The effect of a wound in a *healthy*, *body* is an increased action of vessels; an unusual sensibility and increase of heat, with swelling, pain, redness, and throbbing. This is the PHLEGMONOUS INFLAMMATION.

RESOLUTION is the subsiding of inflammation, and the return of the action of the part to the

* A harbinger of a more violent and universal state of convulsion, is the slighter trembling and agitation of the tendons in the wound. Even a modern author has supposed this to be a proof of sensibility in these tendinous parts, and that this spasm begins with the tendons. But their motion is the effect of the commencing agitation of their muscles.

usual relations. It is of course preceded by subsiding of the inflammatory swelling, and diminution of pain and heat.

In a debilitated and disordered state of the system, this healthy action (healthy, as being natural to a healthy body,) is interrupted. Instead of a due degree of this phlegmonous tumefaction, heat, and redness, the parts are at first pale and flabby; and there runs a creeping dark coloured and diffused inflammation over the skin, which destroys the cellular membrane, and undermines the integuments, and is attended with a small, quick pulse, and a dark coloured cutaneous inflammation. This is erysipelas, and before it attacks a wound, there is shivering, sickness, and general disorder. This inflammation is not simply an effect of the wound, but of the wound in a disordered system. Although it is most apt to follow laceration and punctures, it is a frequent precursor of gangrene.

Erysipelas attacking the skin, without previous injury, commences with nausea, slight rigor, heat, thirst, and restlessness. At first the quickness of the pulse would indicate the propriety of evacuations: but if the pulse be sunk suddenly by bleeding, or the strength reduced by purging,* the worst effects are to be dreaded. The surface has a doughy soft feel without tension, and the redness vanishes on pressure, and there is more of prickling

* I do not consider the evacuation of the contents of the intestines as falling under the denomination of purging; which is properly the operating upon the surface of the intestines by irritation so as to draw copious secretions from it.

heat than throbbing pain. The case is considered very bad, when in a degenerate habit the skin is of a dark or dusky red or purplish colour, and is soft and little sensible; when the pulse is unequal and flaultering; when there has been rigor, followed with lassitude and feebleness, and an inclination to dose. It is still worse when vesications arise with livid bases.

The phlegmonous inflammation is a symptomatic and necessary action of the living body under injury: the erysipelatous is properly disease; and though remotely, it may proceed from wounds; yet I believe it is always an effect of the state of the system, either previously existing or consequent upon the injury.

Suppuration, which is the discharge of pus from inflamed vessels, is preceded by an exacerbation of the symptoms of inflammation, rigors, shooting pain in the part, and increased throbbing. It is followed by a remission of the general tumefaction and swelling, and redness. In an open wound, as the serous discharge is converted into a thick, white, mild matter, the lips of the wound lose their tension (yet are not loose nor flabby); red and healthy granulations appear; by and bye, this mild discharge continuing, a film of coagulable lymph is found attached to the surface when the pus is cleaned away; and this is the second stage preparatory to adhesion.

The pus is thrown out from the same vessels from which the serous discharge flowed, and the change from hæmorrhagy to serous discharge, and

from that to pus and coagulable lymph, is gradual. But it is chiefly important to observe at present, that if there arise a new source of irritation, or if the inflammation be increased, the discharge of pus is again stopped; and that if the discharge is profuse, with a looseness of the lips, the parts must be stimulated and supported, before they will afford a due discharge, and partake of the disposition to unite by the second intention. There is a state of a sore when coagulable lymph covers its surface, in which there is no disposition to heal or unite. When by intemperence and mismanagement the healthy action is checked, the parts become loose and pale, or hard and irritable, and the discharge grows thin and ichorous.

In regard to the formation of matter deep in the body consequent on wounds, there are distinctions to be observed arising from the different natures of the two inflammations, which may have been produced. An abscess or collection of matter consequent upon phlegmon is attended with adhesion of the cellular membrane which confines the fluid; and though it has a tendency to the surface, and falls naturally downward, yet this progress is gradual. But when erysipelas follows a wound, its course is irregular; it has no natural termination; and it will insulate the skin from the part below, and destroy the cellular membrane with a rapidity which the young surgeon does not look for. The suppuration (if such it may be called) which attends it, is accompanied with an irregular dissolving of the cellular membrane, and sloughing; and

to the feeling it is soft, quaggy, and irregular. This inflammation runs along the surfaces, destroying their natural action, and (unlike the phlegmon which terminates by producing adhesion and coagulable lymph in the surrounding parts) it has no termination to its action while the disposition remains. It attacks surfaces chiefly; such surfaces, when capable of high action, as the skin, are inflamed; but in the cellular membrane, which is a part of which the vessels are endowed with little activity, it creeps from cell to cell, and often kills it; the skin loses its support, and mortifies, or it hangs loose, and a thin matter is laid under it. We see the whole side of the head, or the integuments of the outside of the thigh, fall off in black flakes, or we may observe shreds of cellular membrane drawn out of wounds like a rotten rag.

The approach of mortification or gangrene is betrayed by a remarkable but indescribable change in the patient's countenance; often a peculiar wildness of aspect, and anxious, delirious look; great languor and depression; vomiting; a quick, thrilling, compressible, intermitting pulse.

I shall first suppose that in *anasarcous swelling of the legs*, and great debility of the system, attended with a small fluttering pulse, a spot is seen, watery, and in which first the distended thin cuticle disappears; and afterwards little grains or spots, of a black purple or lake colour, appear on the surface. This is the beginning of mortification. This spreads with a marbled mixture of blue, yellow, and dark red colour. Then other spots form; the

pulse becomes very low and tremulous, and the patient sinks.

Gangrene often begins in a small black spot; and the extent of the part immediately tending to the same state, is marked by œdema, or emphysematous inflammation of the cellular membrane.

In consequence of *obstruction* to the action of the circulating vessels, as sometimes takes place from swelling around the aneurismal sac; or from wounds under the fascia and the swelling of the confined parts; gangrene attacks the limb. The pulse is quick and vibrating, and compressible; the countenance pale, thin, and fallen; the limb, œdematous, lies soft and as if dead; the colour is a dark or obscure red; shooting pains are in the toes or fingers; the change is ushered in by rigor; streaks of a deeper red, without any tumefaction, may be seen, and then a vesicle appears, and the redness subsides. This vesicle discharges a brown fluid, and the surface beneath is a dark purple or brown. The toes or fingers have vesicles on them; become black and shrink.

When the granulations of ulcers mortify, we see in the prominence of the the granulations a small black spot, or a speck of dark coagulated blood extravasated: then the granulation fades, and the good discharge fails. At the next dressing, the bottom of the ulcer is foul, with white or greenish shreds of the dead substance; and rapidly extensive wasting of the skin follows; and the tendons or muscles hang relaxed out of the sore. There

is a softness in the whole limb, and want of action. All the patients in the wards of a foul hospital, are often affected thus; and their healthy sores, in the course of a few days, assume the appearance of a half-dissected and neglected limb.*

The coming on of gangrene after concussion of a limb from extensive gun-shot wounds, or cannon-shot, is preceded by a heaviness of the spirits, slight œdematous swelling, and leaden colour of the limbs. There appear in several parts dark brownish spots or stripes; then lancinating pains are felt, the skin blackens, and the cuticle separates. At first the patient is dull and insensible; afterwards there is distress and inquietude. The paleness and lowness in this instance is to be ascribed to the shock given to the nervous system. Cold will produce appearances resembling this gangrene, such as an obscure red and purple colour, with darkness of the nails: but in gangrene, the paleness of death is on the countenance, in the eye, the nails, and the wounded limb.

Mortification, it is said, *sometimes follows high action.* I have not seen gangrene the consequence of high inflammatory action: it should rather be called high irritation, which disorders and over-

* When this attack begins, the patient should have an emetic, and then a cordial draught, or warm wine and spice; and a spirituous fomentation should be put to the limb, and afterwards the carrot poultice to the sore. But what are medicines and surgery here, if we do not attend to the circumstances of situation, air, and diet, which have given rise to this character of the wound. The patient should be removed, the walls whitewashed, and the apartment thoroughly ventilated.

comes the inflammatory action, and is followed by mortification.

There are frequent instances of the swelling and binding of the parts, the consequence of the infiltration into the cellular membrane, and as it were suffocation of the arterial action, which is followed by gangrene of the limb. This is particularly the case after deep wounds, and gun-shot wounds, and deep incisions are required, to unbridle and give freedom to the parts. The practical surgeon will have often to trace the gangrene to improper bandaging; sometimes merely to the binding of the splints in fracture; often to the close bandaging of lacerated wounds, attended with a hæmorrhagy, which has required the firm compress and bandage. When a swelling and dark-coloured inflammation of the skin is seen betwixt the turns of the roller, they should be immediately undone, or in the morning the limb of the patient may be dead.

An abscess is matter formed under the surface in consequence of inflammation; a suppuration where matter is collected, and there is at first no outward communication. Its seat is in the cellular membrane. It is a process of the phlegmonous action, and whilst the vessels pour out the pus, the inflammation condenses the surrounding soft parts, so that by the pressure of the matter, and the action of the vessels, and the throwing out of the coagulable lymph, a regular cyst is in time formed, which contains the matter of the

abscess. An abscess is formed in these stages. 1. There is increasing redness, heat, tension, and throbbing; the whole system is highly excited; one or more rigors succeed. 2. The irritation and fever subside, and there is relief from pain.—And now if the abscess be superficial, there is a redness observable on the surface; it *points:* ulceration takes place in the skin; it bursts; and the matter is discharged, to the more perfect relief of the patient. 3. If the abscess be of great extent, this relief is temporary; in about forty-eight hours, an ichorous discharge takes place of the pus, with pain and constitutional irritation. This stage has been called the secondary inflammation of the abscess.*

Although the walls of an abscess have been in an inactive state for months, becoming as it were naturalized parts of the system, yet immediately upon being punctured a rapid change begins. This change is produced not from the admission of air; for it will take place in circumstances where air cannot be admitted; but in consequence of continuous sympathy, and of the whole internal surface partaking quickly of the action of the lips of the opening. If therefore the lips of the opening into the abscess be made to adhere after evacuating the matter, the cyst of the abscess will not inflame.

* Even in large abscesses, while the cyst is entire, the constitution sympathises very little unless upon this change of the nature of the discharge. The hectic fever is rapidly increased, the daily remission less apparent, the evening accession more severe, and the night sweats more debilitating.

Some have conceived that the inflammation of sacs and of abscesses, in consequence of their being opened, is owing to the air coming in contact with the internal surfaces; others that the phenomenon is to be accounted for by the access of the air to the matter of an abscess, and that it facilitates its corruption. This is a remark worthy of particular attention; but it forms altogether a distinct question, since the same change will be produced by opening a joint in which there is no pus, as by opening an abscess.

The matter of an abscess has always a tendency to the surface. This is the effect of an ulcerative process, attended with an absorption of that part of the stool or cyst next the surface. I conceive the cause of this to be the greater sensibility and proneness to action of the surface. The deeper parts have less sensibility, and less proneness to take the changes of inflammation. By promoting the sensibility and action of the surface, we facilitate the pointing of the abscess.

The fascia, a membrane of no sensibility, and of firm texture, long resists the ulcerative action in collections of matter; a fact which the surgeon must never for a moment overlook; for the matter being resisted in its progress to the surface, will work amongst the cellular membrane, and among the muscles, and under the tendons and fascia.

Hectic Fever accompanies the formation of abscess, and is increased upon the abscess being opened. It has been supposed to proceed from the absorption of the matter; but it corresponds

better with a more extensive review of the effects of disease, to say that it is the constitution sympathizing, with a continued low degree of local irritation. Hence painful affections of the bones and joints, where there is no matter formed, produce hectic.

In hectic fever there is a small, sharp, quick pulse, with pale skin, and loss of appetite, and frequent debilitating perspiration. There is no regular intermission, but exacerbations, preceded by a slight degree of cold stage. The fever is increased about noon; but especially towards the evening there is an increase of symptoms, and towards the morning they abate. As the disease advances, the night-sweats become profuse and debilitating, and a diarrhœa comes on, with an increase of debility.

Collections of matter, when deep-seated and neglected, or improperly treated, instead of filling only one cavity, spread irregularly where the connecting membrane yields most easily to the action. If the abscess burst outwardly, the opening is small at first, and having discharged the matter, the orifice contracts, becomes hard around its edges, continues to drain off the secreted fluids of the cavities, which cavities and sinuses acquiring a habitual action, become hard or fistulous.

This is a change frequently occasioned by neglect or bad management in the dressing; oftener still by intemperance and debauchery, or a debilitated or distempered constitution. In the first place the attention should be directed to the con-

fined impure air, bad clothing, and filth and bad diet; the palid countenance of the patient, and his nightly feverish condition call for an examination: the state of his bowels and his secretions must be attended to before we think of the knife.

If improper dressing has converted an abscess or sinus into a fistulous sore, the lips will be hard and inflamed on the edges, or tumid and inverted; the discharge great in quantity, and thin or ichorous; the pulse hard and quick; and there will be thirst and sleepless nights. Then there must be no stuffing with irritating dressings, but, on the contrary the mildest and most soothing application employed.

See further observations on this subject in the Introduction to the Second Volume.

EXPLANATION OF THE PLATES

IN

THE FIRST VOLUME.

PLATE I.

THIS sketch represents a contracted rectum, and a fistulous opening formed in consequence above the stricture.

A B, The probe passed through the strictured part of the rectum.

C, The part of the rectum above the stricture, slit open.

D, An angular, ulcerated opening, from the rectum into the surrounding cellular membrane, which was followed by a fatal fistula.

PLATE II.

In this plate I have given a view of the operation for hernia, descending into the labium of the woman. From being an inguinal hernia, the intestine had descended to become a hernia resembling the scrotal hernia of the male, only that it is contained in the labium.

A B, The extent of the herniary tumour.

C, From this to B, is the course of the first incision, which cuts through the skin and cellular membrane, and exposes the fascia.

D, The fascia which covers the proper sac of the hernia. After dissecting off some lamina from it, it is pinched up by the forceps, and the knife being carried horizontally

on the surface of the tumour, his layer is cut through: then the directory is pushed under it.

E, The directory pushed under the fascia, to ascertain its nature. Along this the knife is run, laying open the proper peritoneal sac.

F, The peritoneal sac, smooth; with distinct vessels running in it, and so transparent that the intestine gives it a darker hue.

PLATE III.

In this plate we have a view of the second stage of the same operation.

The peritoneal sac has been cut up, and now the intestine appears.

A, A portion of the small intestine, which seems to have been the original contents of the herniary sac, and which had here suffered less by the incarceration.

B, A portion of the great intestine, which had descended more lately, and had been the cause of strangulation. It is known to be a portion of the great intestine, from the greater size, the cellular form, and the fatty appendages which hang from it.

The manner in which these portions of the intestines rise and cover the ring, may give the surgeon an idea of the difficulty which sometimes occurs in cutting the stricture.

PLATE IV.

This plate represents the manner in which the femoral hernia will sometimes rise from the depth of the groin, when freed of the integuments, and the binding of the fascia.

A B, The extent of the incision of the integuments.

C C, An aponeurosis dissected off the proper sac.

D, The hernia covered by the proper sac. The tumour is of a pyramidal form.

E, A cut through the sac.

PLATE V.

This I conceive to be a curious instance of the effect of violence done to the intestine, in pushing it through the stricture, after the sac was laid open. The intestine is here inverted.

A, Villous and cellular coats fairly cut through.

B, The peritoneal coat remaining.

C, An ulcerated hole in the peritoneal coat, which was a consequence of the injury.

This might have been produced by the long stricture of the gut in the tendon. It might have been the effect of too much violence in pressing the air out of the gut, before it was attempted to be pushed up: but I think I saw the finger so forcibly bored into the stricture, in attempting to push up the gut, as to bruise the softer inner coats of the gut.

PLATE VI.

I give a sketch of this torn intestine, that the young surgeon may the better recollect that it is dangerous to use much force in endeavouring to reduce a hernia, especially if there be reason to suppose that the last stage of strangulation is advancing. In this instance, as is too often done, one last powerful effort was made to reduce the hernia, before the operation of the knife was resorted to. The gut was reduced; but we see the consequences.

A B, A portion of the intestine.

C D, A portion of the abdominal muscles and peritoneum, to which the intestine still adheres.

E, The part of the gut which was down in the hernia, torn by the force used in reduction.

F, A quill introduced by the gut and coming out by the torn part of it.

PLATE VII.

This plate represents the effect of continued boring with the bougie, in a wrong direction, after the use of the caustic. A false passage is made, of an inch and a half in length. It comprehends the bulb and lower part of the urethra, cut off from the body of the penis, and a bougie put into the false passage.

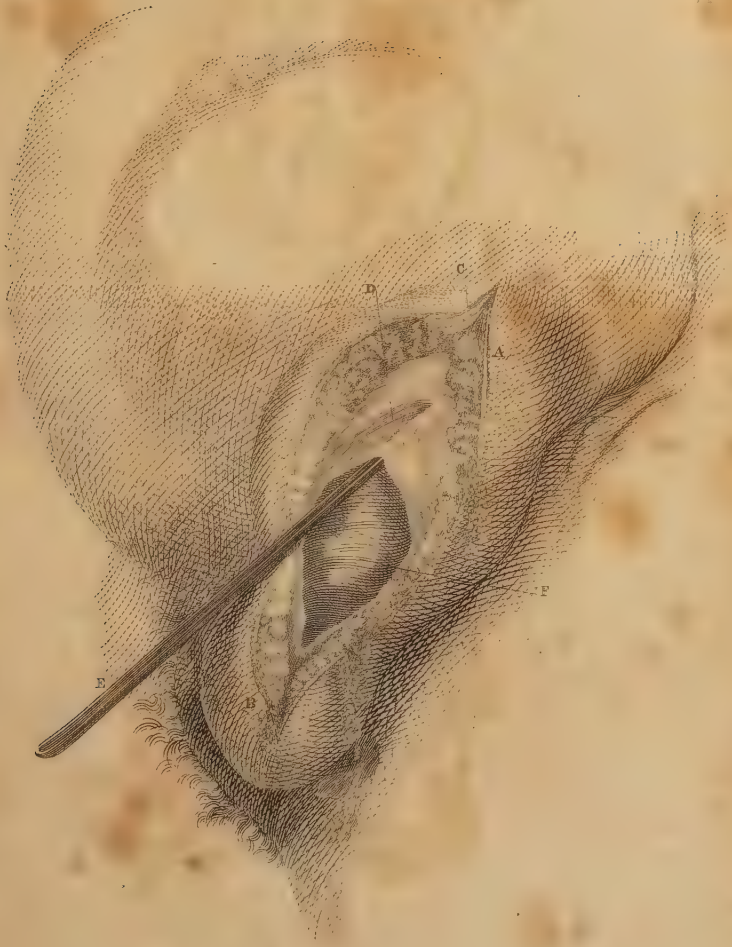
A, The bougie.

B, The bougie in the urethra, above the stricture.

C, The urethra, above the stricture.

D, The irregularities of the stricture shewn, by slitting up the canal.

C
C
B
B
A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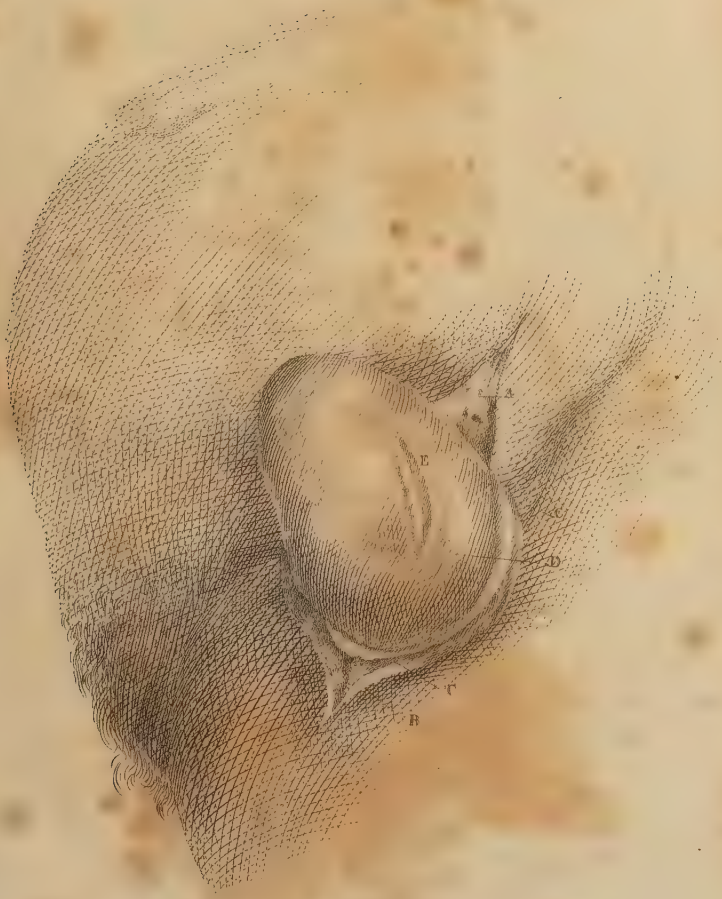
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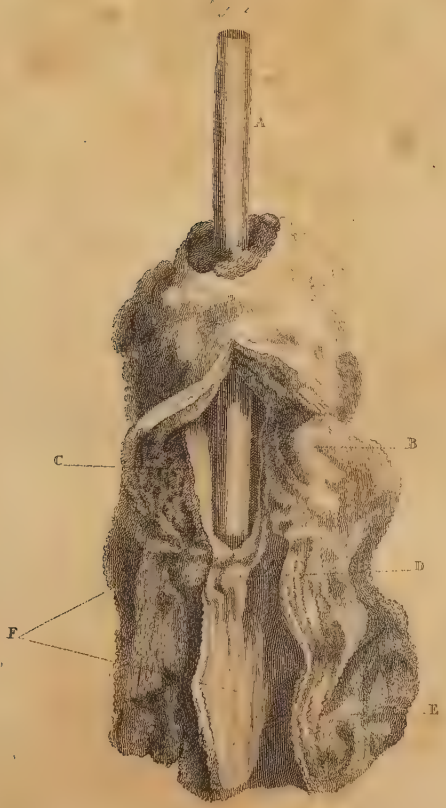
PLATE VI.—VOL. I.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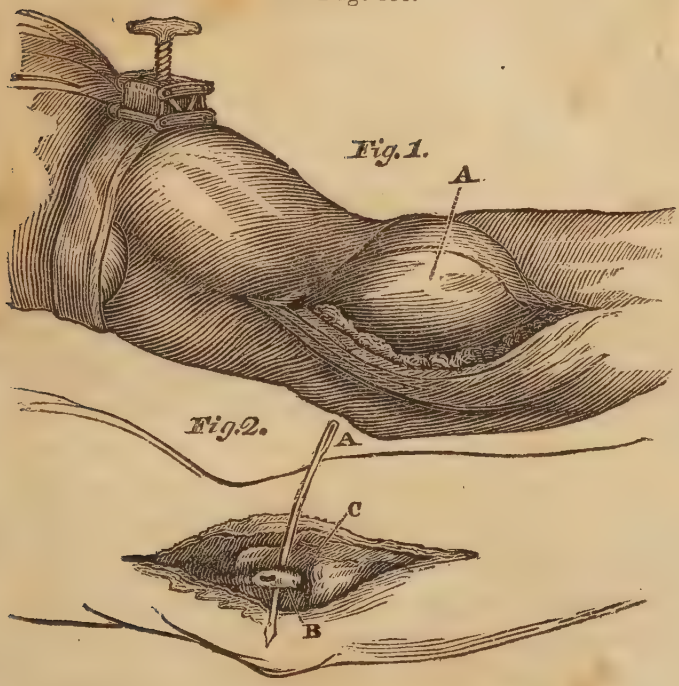


See Page 332.

Even when a piece of tough meat, or cartilage, or a large bone, distends the œsophagus, it does not compress the wind-pipe, but affects the muscles of the glottis only. The most common accidents are these: a piece of meat or cartilage in swallowing, sticks betwixt the cornua of the os hyoides or thyroid cartilage:—coins swallowed by children stick in the pharynx: fish bones which stick and irritate very much: a crumb of bread which being popt into the mouth at play enters the trachea: or a husk of grain drawn in by the breath and adhering near the top of the wind-pipe. All these endanger suffocation by exciting the muscles of the glottis and the paroxysm returns at intervals. Even in difficulty of breathing, and of deglutition, proceeding from tumours pressing on the trachea, the obstruction of breathing is not continual, but comes at intervals, and still depends on the same occasional spasmodic affection of the muscles of the glottis.

Every kind of obstruction will of course be aggravated upon violent exertion. This in some instances we ought to provide against, as in labour. If a woman have a tumour pressing on the wind-pipe with occasional paroxysms of difficult breathing, we should be prepared to give relief during the exertion and determination of the blood to the head, in consequence of labour: or by free scarifications, prevent the tumour from being gorged with blood during labour.

THE EXTRACTION OF BODIES LODGING IN THE PHARYNX OR ŒSOPHAGUS.

The instruments in common use for extracting bodies which stick in the throat, and endanger suffocation, are, the *probang* and the *cranebill* forceps. The probang is a piece of flexible whalebone of about a foot and a half in length, having a bit of sponge tied to one extremity, and at the other a blunt hook attached.

But if we are present when a person is in danger of suffocation, we ought not to run in search of a probang, for almost any thing may do, to push the morsel down. The finger, if dexterously put in by the side of the mouth, will often unfix a body, when lying across the pharynx. The end of a table spoon or a wax candle, and, on some occasions the end of a whip has done good service. Nothing is better for pushing down a morsel than a leek. In a child, and sometimes in the adult, the finger will extricate the substance, either by pushing it down, or hooking it out.

If we are called to a patient having a bone in the throat, we ought not in an impressive and rapid manner to seize upon him ; for this puts him into terror and anxiety that increases the difficulty of breathing. Without much loss of time, it is possible to sit down before him in that composed manner which will give him confidence of relief. —Opening his mouth, you press down the tongue with a spatula or spoon, and endeavour to see the

bone—(we shall often be able to see it, for it may be grasped just upon the entry of the fauces.)—When we can observe it, we should seize it firmly with a pair of forceps, and extract it. Should we not be able to see it, we may put in the finger by the side of the mouth, and so deep into the throat as to touch the bone, and unfix its sharp points, when the effort to cough, and vomit from the presence of the finger in the throat, will often throw it out.

A person suffocating may be able to speak at first, but this is soon over, and the surgeon will be able to learn nothing further, than that the patient is struggling in imminent danger. The first thing to be attempted is to examine the pharynx, and this, both because bodies sticking there are the most frequent causes of suffocation, and because the relief in that case is so easily obtained.

In introducing any instrument into the œsophagus, we should not permit the patient to thrust the tongue forward or out of the mouth.

The probang is introduced by forcing it against the back part of the pharynx. The yielding of the pharynx, and the elasticity of the instrument, directs it downward and backwards into the œsophagus.

The rule is, that all soft or digestible substances are to be thrust down into the stomach, while we must endeavour to catch and pull up such as are sharp and indigestible. But when a large piece of meat or cartilage, or a crust of bread, or piece of tripe, sticks firmly in the pharynx, we should

rather endeavour to bring it up, though it be a digestible substance; for otherwise we may impact it and fix it more firmly by our efforts. If it be within reach of the finger so that it may be unfixed, the effort of the throat will probably throw it out. On this failing we may use the cranebill forceps or common polypus-forceps to take hold of the morcel and pull it forth. In short this must be accomplished in some way, or at least we must have it unfixed from the grasp of the horns of the thyroid cartilage, else the struggle of the patient will soon be over.

A bone we should be unwilling to thrust down, because being sharp, and sticking, to force it down with violence, is to lacerate the œsophagus; we rather attempt to pass the hook end of the probang beyond it, and endeavour to pull it up. All indigestible bodies, pins, pieces of money, stones of fruit and shells, we should endeavour to pull up with the hook end of the probang.—And it may be remembered, that such bodies sticking about the top of the larynx, have been forced into it, by the use of the sponge end of the probang. As we have mentioned a substitute for the probang, in order to push a piece of meat or cartilage down, it is equally necessary to suggest a contrivance for a hook, with which to pull up bodies from the œsophagus, or pharynx. For this purpose nothing is so good as a piece of wire twisted and bent into a hook, as I have represented in the plate.

The advantage of this simple instrument is that it can be made of any form or take any curve

enabling us to adapt it so, as to operate upon that side where the pin or stone is supposed to lodge. In nine of ten cases they stick across the throat within sight. In which case the forceps represented in the same plate are to be used.

We are particularly anxious to bring up pins from the throat, because if they pass down into the intestinal canal, they may stick there and occasion fatal inflammation, and foreign bodies swallowed and sticking in the intestines, have opened a way outwardly by abscess and ulceration. Let us not however take the most unfavourable supposition in the event of a pin being swallowed, for it generally happens that it is passed by stool.

We should not forget that often the soreness left by the body, which has stuck in the throat, gives to the patient the sensation of its being still in the place after it has gone down.

An instrument may be contrived for the extraction of pins in this manner. Take a hollow tube, a large flexible catheter, for example, or such an elastic tube as is in use for injecting fluids into the stomach; to a wire corresponding in length to the tube, tie horse hair or bristles so doubled up that when thrust into the tube, and appearing at the further extremity, they may expand in form of loops. The tube is to be introduced into the throat a little past where the pin is supposed to stick. The brush is then to be thrust forth from the end of the tube, and then the instrument is to be withdrawn, twisting it at the same time; the pro-

bability is that the pin will be entangled in the instrument and extracted.

ŒSOPHAGOTOMY.

The incision of the œsophagus must be a very serious operation, and I know not if I am right in placing the title here, knowing how prone many are to attempt the relief of their patients, rather by a bold and hazardous operation, than by gentle and more persevering means. It must be no common case which warrants an operation of this nature, but though I have not seen I can conceive an occasion for performing it.

Verduc, a French surgeon, first suggested this operation. *Guattani* at Rome saw a case which made a forcible impression on him in favour of it. A drunken fellow in eating boiled chesnuts, threw one up and caught it in his open mouth. He complained that he could not swallow, and was carried to the hospital. As he spoke and breathed they would not believe his story, until he convinced them by his death on the nineteenth day. Guattani opened the neck on the left side, below the larynx and the thyroid gland, which was much swelled. He found an abscess in the œsophagus around the chesnut, and a hole of communication betwixt the œsophagus and trachea.

It will appear to my reader that the case is by no means made out here, since there is no account of the means used to relieve the patient,

and he seems to have died from the negligence of his surgeons.

The history of surgery in France gives us too many instances of the wildest proposals put in execution, from the operators coveting the eclat which attends their performance. Guattani's dissertation on this subject was addressed to the Academy of Surgery, and after it we find detailed two cases in which the operation was successfully performed.

The case which in my opinion would authorize this formidable operation must be of this kind: The body must be sticking not in the pharynx; not in the embrace of the cornua of the os hyoides, but in the narrower part of the passage behind the cricoid cartilage. I believe it will be always possible to extricate the body from the grasp of the pharynx; and, on the other hand, the incision in the higher part of the neck would be particularly formidable and dangerous. But when the body sticks in the œsophagus; when all attempts to extract it and push it down have failed, when at each attempt the body is pushed deeper in its hold upon the œsophagus, giving great pain, and when it is surrounded with suppuration; and, lastly, when the symptoms of consent and inflammation of the trachea supervene, or there is an obstruction to swallowing, formidable by its continuance; then I think the operation may be undertaken with a safe conscience.

The following is the account of the operation as given by Guattani and by Sabatier:

The patient is to sit leaning with the back of his head upon the breast of an assistant. The skin and subcutaneous tissue are to be cut through, making an incision of a suitable extent. The long muscles of the throat which lie upon the trachea, and the trachea itself are to be separated from the œsophagus. If any large vessels are cut, they are to be tied or compressed with the finger; finally, the œsophagus is to be opened where the foreign body lies; when the body may be extracted by the fingers or the forceps.

To the anatomical student, this will no doubt appear a very imperfect account of the operation. There is here nothing accurate regarding either the place of muscles, nerves, or vessels, and nothing of the real difficulty of the operation stated. I shall therefore put the subject more distinctly before my reader.

OPERATION.

§ 1. As the breast of an assistant heaves with the necessary exertion it is an unsteady support, therefore the patient should lie upon a table with the breast and shoulders elevated: an assistant must support the chin and occiput.

§ 2. An incision of three inches in length is to be made in the line of the depression, made by the edge of the mastoid muscle, and the wind-pipe. Before doing this, the thumb ought to be pressed against the lower part of the external jugular vein, so as to distend the veins of the neck, and that

the larger branches may be seen and avoided in cutting through the skin.

§ 3. Small nerves, the cutaneous cervical plexuses, will be divided in cutting through the platysma myoides and cellular tissue. The platysma myoides is to be cut up to the full extent of the skin, to give room in the further prosecution of the operation. In this part of the operation the branches of the R: superficialis arteriæ thyroideæ will be cut, but they are small, and of no importance.

§ 4. The omohyoideus muscle will now be seen running obliquely upwards; it is to be pressed forward. the dissection is to be continued with the handle of the knife. The great jugular and the carotid arteries (included in their sheath) are behind. The convexity of the thyroid gland is forward. The superior thyroid artery is the utmost reach of the incision upward; and the inferior thyroid artery limits the extent of the incision downward.

§ 5. By going directly behind the thyroid gland no vessel of consequence will be met with. If a vessel should happen to be cut high in the wound. it will be the superior thyroid artery: if one be cut deep in the wound, and at its lower part, it must be the inferior thyroid artery. The inferior thyroid artery being cut, and shrinking beneath the sheath of vessels may prove very troublesome. It must be secured. It is almost superfluous to add that the needle must not be used in taking up

vessels wounded in the neck; the vessels must be drawn out by the forceps or tenaculum.

§ 6. The œsophagus being now exposed, and the body felt through it, it is to be cut upon and extracted; the incision of the œsophagus is to be made in the length of that tube.

§ 7. The sides of the wound being brought together, the patient ought to be fed through the elastic tube introduced into the stomach.

The œsophagus may be cut into somewhat lower than I have here supposed; but the operation will be more difficult, because the mastoid muscle will confine the space, and the lower thyroid artery will lie in the way of the incision.

OF BODIES LODGING IN THE LARYNX.

Very often small bodies, as peas, and cherry stones, or nut shells, &c. fall into the chink of the glottis. Then the breathing becomes sonorous or stridulous, with heaving of the chest, and long and difficult respiration—there is not that action, partaking both of coughing and vomiting which is the effect of something sticking in the upper part of the pharynx.

Even when a body of a considerable size sticks in the sacculus laringis, the patient is not immediately suffocated. Dr. Jeffrey of Glasgow has a preparation in which a piece of coal fills the trachea almost entirely, yet the patient lived for three days.

When the foreign body passes entirely into the trachea and does not stick in the more irritable glottis, it gives less distress, though there is every moment danger that the breath may throw it again into the grasp of the glottis and suffocate the person.

When a body is drawn into and lodges in the larynx, it may be known from the convulsive cough, wheezing and rattling in the throat, the weakness and hoarseness of the voice. Sometimes when there is a dreadful difficulty of breathing, the symptoms will suddenly remit, and the person become easy. After several changes from tranquillity, to laborious respiration, and from difficult to easy breathing, the patient may be at the end of some days suffocated suddenly. It happens thus, the body is loose, and is sometimes lodged in the trachea, sometimes near the glottis. When in the trachea, (the sensibility of which is much less than that of the upper part of the larynx), the patient breathes easily, but when the body is moved towards the more sensible glottis, then comes the spasm of the muscles of the glottis, and great difficulty of breathing. Meantime with each successive attack, the parts are inflaming and becoming more irritable, and the violence and difficulty of breathing are producing a degree of effusion in the lungs which increases the evil. One more severe paroxysm succeeds and the patient is suffocated. It would be easy to furnish many striking cases of children thus suffocated.

1. We have to ascertain the nature of the accident. See that the cause of suffocation be not in the upper part of the pharynx, and ascertain the nature and size of the foreign body. 2. Observe, whether posture by throwing down the body into the wind-pipe, does not relieve, and if the sense of suffocation has been preceded by posture or circumstances which would favour the shifting of the body into the rima glottidis. 3. We have to observe, if the breathing become more and more difficult in the interval of the spasmodic attack. 4. If from the greater violence of the paroxysm, the membrane of the larynx be inflaming and swelling, then the danger is imminent, and the operation seems to be the only remedy. 5. If there be any puffiness, or emphysematous tumour of the neck, during the previous stage of suffering, before the operation is determined on, the air from the lungs may have escaped into the cellular membrane.

We bleed frequently, and give an opiate in a mucilaginous mixture, which is to be taken by frequent sipping, rather than as a draught. For this will often give relief of the teazing, tickling sensation that precedes the paroxysm. It has been recommended that we should excite vomiting, or sneezing, which by the suddenness of the action of the respiratory muscles, may throw out the body from the larynx. But should the body be removed more directly into the current of air, by this means, and yet not altogether discharged, but impacted, the consequence might be fatal.

The reader may see in my collection a preparation of the parts, where the operation of laryngotomy was performed without any alleviation of symptoms. There are not wanting examples on record, where, after the operation, the patient has raised himself, breathed freely and discoursed, all obstruction being removed, and yet in a little time he has sunk lethargic, and died. Some have ascribed this to congestion in the head, but I have reason to ascribe it to infiltration into the cellular membrane of the lungs. However we may account for the fact, it suggests a very important consideration; in the operation of laryngotomy, as in some other operations, a delay prolonged till the very last and most urgent symptoms shew themselves, gives time for the supervening of another disease, and the actual occasion of death is not what we sought to relieve by the operation.

I shall suppose that some small body as a bone, the stone of fruit, or a nut shell has been drawn in by the breath, and now lodges in the sacculus or ventriculus laryngeus, giving great distress, and endangering suffocation.

§ 1. The patient is to be laid upon a table, the head a little elevated on a pillow, and turned a little to one side. The meaning of this inclination to one side is to allow the blood to flow over the edge of the wound, instead of dropping into the incision of the larynx, which, when it happens, produces coughing and much disturbance.

§ 2. The incision is to be carried through the integuments from the prominence of the thyroid cartilage down nearly to the thyroid gland.

§ 3. The thyroid gland ought not on any account to be cut, for it is a very vascular part, and if touched with the edge of a knife, the blood from it will not be easily stemmed.

§ 4. If a vein appears it is to be pressed aside. The obstruction to respiration prevents the free return of blood from the veins of the head, and every vein cut will pour out its blood like an artery.

§ 5. With the common scalpel make an incision through the cricoid cartilage, and through the membranous space that intervenes betwixt that cartilage and the thyroid cartilage. Hold open the cartilages and let the free respiration be established.

§ 6. If the body now appears in the wound, it is to be extracted with the forceps; if not, it may be felt perhaps with the point of the little finger, introduced betwixt the edges of the cut cartilage. Or a probe may be introduced into the larynx, and directed upwards so as to unfix the body and push it into the pharynx.

§ 7. Desault and Pelletan have practised the slitting up the thyroid cartilage, to extract bodies impacted into the sac of the larynx. I think the operation should be first attempted, as I have here recommended, so that, if possible, the cordæ vocales may remain undisturbed. A considerable loss of blood may be of advantage after the fatigue

to the lungs and the wound of the larynx ; if there should be little blood lost by the operation the patient ought to be bled with the lancet. When the blood has ceased to flow from the wound the edges of the integuments are to be brought together, and the plaster may be so applied that the wound of the integuments shall be drawn a little aside, so as to cover the wound of the cartilage.

OF THE OPERATION FOR THE INTRODUCTION OF A TUBE INTO THE WIND-PIPE.

THERE are two places at which the operation may be done : 1. Above the cricoid cartilage, in which case it is properly laryngotomy ; and 2. Nearer to the sternum and on the face of the trachea. The latter of these places I should prefer where there is inflammation. In the first place, because it is more removed from the moveable glottis, the spasmodic constriction of which is probably the cause of suffocation ; and also because I conceive the operation may be performed in the trachea by merely making an incision and holding the edges of the trachea asunder with a small spatula, or any such instrument. Many occasions must present themselves where it will be necessary to perform the operation on the lower part, and one of the most urgent is, where there has been a wound in the throat, followed by tumefaction of the parts : thus bronchotomy has saved the life of one shot in the thyroid cartilage.

TO PERFORM THE OPERATION BETWIXT THE THYROID AND CRICOID CARTILAGES.

The surgeon, placing his finger upon the prominence of the thyroid cartilage, or pomum Adami, carries his finger down upon the fore part of the throat for the space of a full inch; he finds there a depression and softness; moving his finger further down, he feels the cricoid cartilage like a ring encircling the throat; but it is above this ring and in the spot where he feels the depression, that he is to perforate and introduce his canula.

OPERATION.

The surgeon is to make an incision over this place with a small scalpel if he has it, or with his common lancet. He then clears the blood away, and if possible waits until the bleeding is stopt, (using what means he can to that effect,) then with the point of his lancet he perforates and introduces his canula obliquely downward and backward.

The spatula introduced into the wound, and turned so that it keep open the wound may give freedom to breathe; a large silver catheter, or the canula of a trocar, or even a large goose quill, or, best of all, a piece of sheet lead rolled into a tube and smoothed, will be a substitute for regular apparatus. These I mention now, because it is an operation which requires to be done on the spur of the occasion. The regular instrument with the double canula is to be found in the shops; but I imagine a simple canula, having a slight but equal

curve, and with a blunt stilette, will serve every purpose. For the perforation being made by the common lancet, the conical point of this instrument would easily follow.

The size of the canula should be that of one of the nostrils.

In performing the operation on the fore part of the trachea, more precautions ought to be observed.

OPERATION OF BRONCHOTOMY.

§ 1. The surgeon ought to have a scalpel, a lancet, canula and stilette, and lint, and sponge, and a styptic fluid.

When the finger is moved upon the throat from the cricoid cartilage downward, a softer eminence is felt on the fore part of the trachea, immediately after the finger has passed the cricoid cartilage :— This is the isthmus of the thyroid gland, and is carefully to be avoided.

§ 2. The incision through the skin is to be commenced below the isthmus of the gland, and carried downward an inch and a half.

§ 3. In the next touch of the knife the thyroid veins are to be avoided, and the sterno-hyoidei and thyroidei muscles put aside, so as to expose the trachea. If the veins have been put carefully aside, not cut across, and the thyroid gland has been avoided, there will be no bleeding to interrupt the further operation of cutting into the trachea, and introducing the canula.

§ 4. The cut into the trachea is made by dividing the rings, with the same knife which is used for the first part of the operation, or with a lancet.

§ 5. It is recommended by some to push in a sharp stilette and canula without a previous incision of the trachea. The intention of pushing a trocar and canula into the trachea without making a cut, is, that the canula may so exactly fill the opening in the trachea, that no drop of blood may fall into it.

In a child the trachea is very small, and operating with the canula and stilette, the trachea has been transfixed, and the child suffocated.

§ 6. It may become an urgent duty of the surgeon to relieve a patient by the operation of bronchotomy, where the regular apparatus is not at hand. In that case I would advise the rings of the trachea to be slit in the length of the tube, rather than betwixt the rings; for then it is easier, by means of a common spatula, to separate and keep open the sides of the wound, until the respiration be freely established, and until the proper tube be procured.

§ 7. Authors speak on this subject, as if a drop of blood, entering the wind-pipe at this place, would irritate and excite the lungs, as an excoriating humour, or a hard substance does the glottis or epiglottis. Bleeding is if possible to be avoided, and I believe it always will be possible; but this dread of bleeding is not to make us defer this operation under the idea, that it requires a very particular apparatus. If we have a tube, cannot the incision be adapted to it, and if there is an oozing of blood, can we not tie a dossil of lint round the canula, and, which pressing upon the

trachea around the opening, may either suppress the bleeding, or at least hinder the blood from falling into the wind-pipe, should the opening be twice the size required to pass the tube. Hurry and confusion, however, in this operation, and inattention to this subject, will lead to the most deplorable consequences. A friend of mine, and a very celebrated surgeon, told me he saw a gentleman die of loss of blood, and from the falling of the blood into the trachea; I suppose the operator must have cut upon the substance of the thyroid gland. The patient, saved from the water, was suffocated in his own blood.

§ 8. If the blood is seen to flow from one point, whether it may be from a vein or from the thyroid gland, it may be stopt by the use of the common needle in the manner, which I have recommended in the introduction.

§ 9. The tube being introduced, the surgeon will naturally hold it with his fingers until the respiration is fully restored; it may be then fixed, and the process is this: folding a large piece of lint together, it is cut into a circular form, then it is slit up to the middle, and a part cut out to answer to the canula. This compress (now consisting of distinct pieces) is to be put betwixt the wound and guard of the canula, so as to keep the end of the canula its due length, inserted into the wind-pipe. After this, a band put round the neck may be fixed to the wings of the tube, and compress it sufficiently, without forcing it too far into the wind-pipe.

When the skin and perhaps the thyroid gland swell in consequence of the operation, then may several of the pieces of cloth be taken from betwixt the wound and the guard of the canula ; so as to allow the extremity of the canula still to keep its place in the wind-pipe.

Having secured the present safety of the patient, the attention will be naturally called, in the next place, finally to remove the cause of the obstructed respiration.

THE INTRODUCTION OF A TUBE INTO THE GLOTTIS TO RELIEVE THE OBSTRUCTED RESPIRATION, OR TO DISTEND THE LUNGS.

A FLEXIBLE tube has been introduced into the larynx, by the natural opening of the glottis, as a substitute for the operation of bronchotomy. When I consider the difficulty of doing this in any state of the parts, but especially when I consider the consequences of poking in the throat of a man already suffering a paroxysm of difficult breathing, and in immediate danger of suffocation, I can not recommend the operation.

This operation is also proposed as the best means of inflating the lungs in suspended animation. The difficulty is undoubtedly much diminished in this passive state of the parts.

The extremity of the tube intended for this operation should be of an oval shape, or flattened on the sides to correspond with the shape of the *rima glottidis*. It ought to be curved so as to pass

over the root of the tongue, and be capable of descending into the larynx.

The body of the person being kept erect, and the head supported, the operator is to put the forefinger of the left hand far into the mouth, so as to press the tongue and drag it forward. If in this position of the parts, the surgeon can see the top of the epiglottis, he passes the tube into the mouth, and, carrying its point over the apex of the epiglottis, he passes it directly downwards behind that body, when it will enter the glottis ; or supposing that he cannot see the epiglottis, by passing the mouth of the tube close upon the dorsum and root of the tongue in the middle line, he will feel the instrument meeting the epiglottis, just at the time that the point of the tube disappears behind the convexity of the root of the tongue. When the point of the instrument is in this position, if the operator pushes it onward, he will push the epiglottis down upon the glottis, and it will then be impossible for him to hit the passage, it being then effectually guarded by the epiglottis. He is therefore to carry the point of the instrument over this interruption, and immediately to make it descend into the larynx, by raising his hand, and consequently depressing the point.

DISTENDING THE LUNGS BY THE PIPE INTRODUCED INTO THE NOSTRIL.

Without waiting for an apparatus, and without putting the tube either into the glottis or making

an incision into the trachea, it is possible to inflate the lungs. I conceive it to be of much importance to give the lungs their mechanical operation early in the case of suspended animation; and for this the following method is to be had recourse to:

1. Introduce the finger into the mouth and draw forward the tongue; this is done with the intention of raising the epiglottis and opening the glottis. 2. The next thing to be done is to place the fingers of an assistant upon the thyroid cartilage, and to teach him to press the larynx backwards, so as to close the œsophagus that no air may be permitted to pass into the stomach. 3. Introduce the tube in one of the nostrils, and with the right hand raise the lower jaw, close the lips and the nostril not occupied by the tube. 4. Distend the lungs by breathing into the tube, if the proper bellows have not been brought. 5. Now let the mouth be free, compress the chest and discharge the air. Repeat the distention, and so renew the act of respiration while there is hope.

DISTENDING THE LUNGS OF AN INFANT NEWLY BORN, IN WHICH THE ACTION OF RESPIRATION IS RETARDED, AND THE LIFE IN DANGER.

In a natural labour the delivery of the child and consequent contraction of the uterus, compresses the placenta to that degree, as to diminish the circulation through it without suddenly and at

once depriving the infant of the function. By this defect of circulation in the placenta, the heart is distended as in the impeded respiration of the adult, and relief is sought in the same efforts. Before the voice of the infant is heard, the whole extensive class of respiratory muscles may be observed in convulsive action; presently the air is admitted into the lungs, the voice acquires force, and the pulsation of the cord diminishes in strength. This substitution of the lungs for the function of the placenta should be established before the cord is cut.

But very often by the protracted labour, or by the preternatural presentation and delivery of the child, or the falling down of the cord, the child is born in a state of suffocation.

It is to be observed, that the infant will bear the interruption to the process of oxygenation longer than an adult will the obstruction of respiration. Therefore the attempt to re-animate the infant is to be made in circumstances of delay which would forbid all hope in the adult.

The good women on receiving the infant are apt to be too active in their tossing and rubbing and slapping the breech, giving a too rough reception to it; which however in a strong child is attended with no bad consequence. But when the infant is born in a state of asphyxia this will not avail.

1. Put the little finger into the throat and press forward the tongue.

2. Placing the infant before you with its head towards you, grasp the cartilaginous margins of the thorax with the ends of the fingers, push them into the hypochondria, as it were, softly, so as not to injure, but deep; then raise the thorax forcibly up as if you were expanding the lower margin of the chest. The child will then inspire with a convulsive sob, startling from its suddenness. The thorax is to be compressed, and the same assistance and excitement given to the expansion of the chest.

3. This failing, a quill is to be put into the nostril, and the mouth shut and the larynx pressed. You are to breathe into the lungs, and then to compress the thorax, giving vent to the air by the tube; and now if any irritability remain, you will be assisted by the irregular and spasmodic action of the muscles of respiration. By and by they will be found to act in more regular succession, when you are to desist from the artificial breathing.

4. The fingers being under the cartilage of the ribs, on the left side, will inform you if you are letting the air escape into the stomach.

By this means I have recovered many children, when the hope and the exertions of the old women had ceased. On the occasion of a child dying suddenly under my care, and supposing it to be from some convulsive action, which I hoped might cease; by the means I have described, I renewed the action of respiration four times. But the period of spontaneous respiration shortened successively, and was more and more feebly per-

formed. Yet if the death had depended on any temporary cause, or had proceeded from any accidental obstruction to the action of the lungs, I think I should have succeeded.

OF THE USE OF THE FLEXIBLE PIPE, INTRODUCED INTO THE ŒSOPHAGUS.

It is not long since, the only means suggested to us of nourishing a patient who had an obstruction of deglutition, was by clysters, or by forcing down solid food into the œsophagus by the probang.

It was therefore a very happy invention of Mr. Hunter, in a case of impeded action of the throat, to cover the probang with an eel-skin, which, being introduced into the stomach, enabled him to inject nourishing soups. For the same purpose we now use the flexible gum-tube, having adapted to it the nozzle of a syringe, or injecting bag and pipe.

In the introduction of the tube, we must be careful that we do not commit a blunder, which though not likely to happen, yet because it may happen and prove fatal, we must always consider; I mean the introduction of the tube into the wind-pipe, instead of the gullet. In the first place, then, it is wrong to make the patient open the mouth wide and push out the tongue, and at that instant to introduce the tube quickly, for by the projection of the tongue, the epiglottis is raised to the utmost; and if the patient should have such a command over himself, as to persevere in keeping

the tongue thus, while the tube touches the throat, the point of the tube may pass into the glottis. On the contrary, the patient should be directed to do that, which indeed he will naturally do, when he feels the tube in the fauces ; let him imitate the action of swallowing, draw back the tongue, and consequently push down the epiglottis : and the tube should not be passed quickly into the throat, but slowly, moving the point of it off the soft palate to the back part of the pharynx, when (being flexible) it will be directed into the bag of the pharynx and into the œsophagus.

Yet after this precaution, and when the tube is in the œsophagus, we pass the upper part of it through a sheet of paper, and then hold the flame of a candle to it. It has happened that in this experiment the air, rushing from the tube, has shewn it to be in the trachea, and not in the œsophagus !

The liquid food, which is to be thrown into the stomach in this way, must be cooler than what a person could take by the spoon, for it flows continually hot upon one part of the stomach. And I have dissected a body where I suspected a patch of inflammation, in the inner surface of the stomach, proceeded from this cause.

If it should be thought necessary to keep the tube in the œsophagus for any considerable time, it must then be introduced through the nostril ; and here it is necessary to be still more particular, that the throat be exerted, as in swallowing, in order that the tube may pass into the pharynx.

There are many occasions on which the tube is to be used to convey nourishment into the stomach: for example, in young women affected with hysteria, paralytic affections of the œsophagus are not unfrequent, and the patients would die of this trifling complaint but for this invention. I have attended a girl who was nourished for two months in this way, the affection of the throat was entirely cured, but some months after she died of a complication of disease.—The œsophagus on dissection was quite natural. Ulcerations in the tract of the œsophagus I imagine are perpetuated and increased to a fatal degree by the perpetual irritation of the œsophagus in swallowing. The action itself is an excitement, and the matters swallowed cannot fail to lodge about the ulcerated surface. In this case the use of the tube will form a necessary part of the cure.

The œsophagus is subject to a cancerous ulceration. It becomes hard, and irregular, and ulcerated, and the muscular structure of the tube being destroyed, the continuous action, by which the food is carried into the stomach, also fails, and the flexible tube is necessarily employed.

Sacs are sometimes formed of the pharynx. At first, by some accidental lodging of the stones of fruit, perhaps, and afterwards by the accumulation of the food in the sac. Each meal forcing a little more into this hole or sac, it at last is enlarged into a bag, which having formed by the side of the œsophagus, and being crammed with the food in the attempt to swallow, presses upon the œsophagus,

and obstructs the passage into the stomach. If the flexible tube be used, the food will no longer accumulate in the lateral sac, and this sac may shrink and be obliterated.

Abscesses, forming by the side of the pharynx, and opening into it, afterwards receive the food in the act of swallowing, with even a worse effect than in the last instance; this too the flexible tube may palliate or cure.

When a person has attempted self-destruction by firing a pistol into his mouth, and the brain and spinal marrow and carotids have escaped, there is danger of suffocation from the inflammation and swelling of the throat, and the action of swallowing is for a long time impeded. Here the tube has been of essential service.

When the attempt at suicide is made by cutting the throat, the action of swallowing impedes the cure, because the larynx is pulled up in swallowing, and by this means the union of the trachea is prevented, and even the outward wound torn open. It may be required to force them to swallow; and here the flexible tube is also of great service.

EXTRACTION OF BODIES WHICH HAVE BEEN DROPT INTO THE EAR.

Children in play will sometimes let pellets of paper or little balls or stones drop into the tube of the ear, and force them deep by the attempts to extricate them.

The consequences are sometimes the swelling of the body so introduced, oftener the tumefaction of

the membrane of the tube, and, when the body has been long detained, inflammation and suppuration of the ear. The pain and distress may be easily conceived. Very alarming cases are on record.

1. Inject a little oil into the ear.

2. If the body has been long introduced, and the tube of the ear be swoln, a tent should be used, which by its swelling may enlarge the passage, and permit us to see the body. I need not add, that in doing this we are to avoid pushing the body further in.

3. In attempting to seize the body with the forceps, it may be driven further into the passage, which is very awkward. This is owing to the blades of the forceps being short, and of the common kind, and of course presenting inclined planes to the surface of the spherical body, which, therefore, starts off the grasp of the forceps. The forceps should be bent at right angles in the form of the cranebilled forceps, or in the shape of the hare-lip forceps of the shops; and their extreme corners ought to be a little depressed, so as to retain what they grasp. Such an instrument is useful for many purposes.

4. When the forceps cannot be successfully used to seize the body, they are useful in holding open the sides of the tube. Being introduced shut, until they touch the body, they are to be taken into the left hand and opened: the body being discovered, the probe is to be used like a lever, to unfix and bring forward the body. But for

this purpose, the round probe will not answer, the point of the silver probe being flattened by the stroke of a hammer, polished, and a little bent over at the extremity will serve the purpose.

5. The body being brought forward by the probe or lever, it will fall into the grasp of the forceps, and can then be extracted.

OF THE EXTRACTION OF BODIES WHICH HAVE BEEN INTRODUCED INTO THE NOSE.

HERE is a subject in which I shall leave my reader to exercise his ingenuity, merely stating the following circumstance, that he may not allow himself to be deceived as I acknowledge to have been.

A physician requested my assistance to a boy of eight years of age in these circumstances. He had become offensive to the family from an intolerable fœtor of his breath, with a fœtid discharge, and occasionally blood from his nose. I examined the passages, I felt behind the soft palate, but could discover nothing wrong. The discharge, however, and the fœtor, like that of a diseased bone, were very evident. I ordered an injection of lime water and calomel. This being thrown up for some days, I found that the boy became sensible of something sticking in the cavities of his nose and tickling him. The nose bled more readily than usual upon blowing it, and the fœtor was diminished. On this visit I examined his nose again with the probe, and now distinctly

discovered a body rough and gritty, and from the grating on the probe and the peculiar fœtor, I had no doubt of an exfoliating and loose bone. Still it puzzled me to find no swelling of the palate, no affection of the eyes, no disturbance of the lachrymal passages, nor any thing to account for so large a portion of bone lying in the place of the spongy bone. The extraction of this body was difficult; for on seizing it with the forceps, though it proved loose, it was evidently much too large to be brought through the nostrils. I set about breaking it to pieces, crushing it in the grasp of the forceps, by applying the blades on the several surfaces of this irregular body: it broke under pressure like a portion of the œthmoid bone, or like a shell. I at length extracted it, no doubt somewhat injuring the passage, which bled plentifully. Being by this unexpected operation thrown out of my time, and now hurried, I threw it into a bason, and bade the family preserve it, that I might examine it carefully. Next morning, upon washing away the mucus and blood, the substance still resembled one of the spongy bones in shape and substance, but on breaking it across I found it fibrous, and on further examination, I found it to be a piece of coarse rag, upon which had formed a scale of concreted stony matter. The family now remembered, that two years before, lint had been stuffed up the child's nose to suppress a bleeding from the nostrils.

OF THE EXTRACTION OF BODIES FROM THE URETHRA.

I HAVE a pin of the length of five inches, which a gentleman said he found in the urethra, pricking him when he awoke in the morning. It was necessary to cut it out. It is possible that the instruments introduced into the urethra may slip from the operator's hands. And patients in the habit of introducing bougies become fool-hardy, and break them in the passage. Children will sometimes play tricks with themselves and introduce pins and small bodies into the urethra. Men with strictures in the agony of their suffering, will push straws or wires into their urethra, or almost any thing they can find to pass, although there be danger of their breaking in the passage.

There is a particular kind of forceps for extracting bodies from the urethra, it is like a port-crayon: it consists of a small pair of elastic forceps fitted to a tube, so that being introduced through the tube, they expand and fill the urethra, and the tube being pushed forward upon the forceps they close and retain what is within their grasp.

In making the attempt to extract the body with the forceps, the first precaution ought to be to avoid the danger of driving it deeper. Therefore the finger is to be fixed upon that part of the urethra behind where the body lodges, so that in introducing the instrument down to it, and in making the necessary pressure against it in order to grasp it, there may not be the possibility of its escaping farther into the urethra.

If a bougie or any instrument of the kind should slip into the urethra, the first care must be to fix it where it is, and prevent its passing farther. This it will be easy to do if the farther end of the instrument can still be felt in the urethra. If not, the finger must be oiled and passed into the rectum, and by turning up the finger behind the prostate gland, it will be possible to reach the further extremity of the instrument and press it backward; and now the instrument or body in the urethra being fixed, the penis is to be pressed back, and then the instrument being grasped through the penis, it may be drawn a little forward assisted by the finger behind, and by little and little this attempt being repeated, the instrument may be made to appear again at the orifice of the urethra.

When the substance in the urethra is soft and will not bear this pushing out from behind; when it has a sharp point which has caught the membrane of the urethra, and therefore cannot be either pushed out from behind, or seized with the forceps, or when it is rough and sharp, and cuts the membrane, or tears it in making the attempt to extract it, it ought to be cut out.

1. In cutting upon a body which lodges in the urethra, the first care must be to fix it that it may not start back. 2. Let the incision be free in regard to the integuments, and let it be a fair perpendicular cut upon the body to be extracted. 3. The incision if practicable should be made before the scrotum; the place next to be preferred is in the perineum. But there is no objection to

the incision being made, first dragging the scrotum either backward or forward in order to cut into the urethra further ; then in that case it is particularly necessary to guard against the infiltration of the urine into the scrotum. 4. If the body has lain behind a stricture, that is to say, if after the extraction of the body there is any narrowness of the urethra, it will be necessary to keep a catheter in the bladder while the wound is healing. But if the passage for the urine be perfectly free this will not be necessary.

EXTRACTION OF FOREIGN BODIES FROM THE RECTUM.

Sharp and irregular bodies, which we would be apt to suppose could not pass through the whole track of the intestinal canal without sticking or greatly injuring the delicate surfaces, do notwithstanding very often pass without interruption, until they present at the sphincter ani. From the nature of this muscular ring, which guards the extremity of the gut, the bodies are prevented from escaping, and give great distress. They produce abscess, obstruct the evacuation of the bowels, and disorder the regular action of the muscles at the neck of the bladder.

Few precautions are necessary in extracting such bodies. 1. The patient stoops forward, his head resting on the bed. In examining, the back of the hand is towards the perineum, and then the natural bending of the finger, introduced into the rectum, answers to the curve of the intestine which enlarges backward. 2. When the body is

felt, the object is then to discover the direction of the sharp point if it has one. The forceps are to be directed by the fore-finger of the left hand ; the polypus forceps, or the lithotomy forceps will best answer the purpose. When the body is in the grasp of the forceps it will seldom answer to pull directly, for the obstruction which occasioned the necessity of the operation remains. It must be pushed upwards or backwards, that is, in a direction opposite to its point. A pin or nail, or even a sharp bone, can not be otherwise extracted, and the attempt will lacerate the rectum. 3. Having unfixed the body from its hold, with the assistance of the fore-finger, the extremity of it is to be brought down ; if this sharp point is forward, it must be wholly grasped and covered with the blade of the forceps, so that they may be a defence to the sides of the rectum. 4. Perhaps the body may admit of being crushed and broken before extraction.

I shall here just remind my reader of the nature of the concretions which form in the intestines, and sometimes descend into the rectum, and of the ball stool, which produce such distress. It has happened repeatedly, that after a patient has been teased with medicines to check a diarrhœa, or has suffered under the conviction of a fatal disease, a well-informed surgeon or apothecary has discovered the complaints to arise from mere hardened feces, or from balls of alvine concretion.

Such concretions have formed in the caput coli, or in the arch, or (as happens perhaps more frequently) in the sigmoid flexture of the colon, and

after painful motions of the bowels, have been moved from their original situation, and presented just above the sphincter ani. Being discovered there, they may be extracted by the large lithotomy forceps.

The concretion may not, however, descend entirely into the rectum ; but, lodging in the last turn of the colon, it may double down the gut, and press upon the rectum, so as effectually to obstruct the bowels. A long flexible injection pipe passed up to the seat of an alvine concretion so situated, may prove successful, both in procuring relief by evacuation, and eventually by causing the descent of the whole mass.

SECTION II.

OPERATIONS OCCASIONED BY THE OBSTRUCTION TO NATURAL PASSAGES, AND PROCEEDING FROM DISEASE.

OF THE CATHETER.

THE occasions of using the catheter are, these: 1. Spasm of the sphincter muscles, which surround the urethra near the neck of the bladder, in consequence of debauch or irregularities, or cold. 2. An inflammation or fulness of the vascular tissue which surrounds the neck of the bladder. 3. Paralysis of the bladder. 4. Swelling of the prostate gland. 5. A bruise and extravasation in the perineum, or abscess by the side of the urethra or neck of the bladder.

The first is merely a want of the usual consent betwixt the action of the bladder and the relaxation of the sphincter vesicæ. It is often produced by the necessity of retaining the urine, when there has been frequent inclination to make it. It is this occasion of obstruction which is so apt to yield to the mere introduction of the bougie; for the withdrawing of the bougie, being like to the flow of urine along the passage, restores the consent of parts and the action in the bladder and

sphincter. This cause of obstruction, when it combines with stricture (which it almost always does), or indeed with almost any other cause of obstruction, makes the case complicated.

That fulness of the numerous veins which surround the neck of the bladder, which sometimes follows upon irregularity, and is accompanied and marked by a sense of tension, throbbing, and often with piles, I have thought to be a principal cause of obstructed urine. In this case, blood is very apt to follow the introduction of the catheter, and this generally procures relief. Yet this is not to recommend general bleeding: bleeding with leeches, and afterwards fomentations, or the semicupium, or bladders of hot water to the perineum and pubes, and the injection of clysters, with warm water, oil, and opium, will relieve.

The third cause of obstructed urine, viz. paralysis, is one which it is of peculiar importance for the young surgeon to observe; and with regard to which there have been many very terrible mistakes. It may be produced by any accidental or occasional over-distention of the bladder, by which the fibres being extended beyond their natural length, lose their power of action. The extension of the bladder by three pounds of water has caused it. After the urine is drawn off, the paralysis will sometimes continue, and the bladder recovers its powers very slowly, which makes it necessary to watch the patient. It will be found necessary to pass the catheter at stated times, until the entire recovery of the powers of the bladder.

The best example of the effect of distention, in producing paralysis, and the plainest proof that the action of the muscular coat of the bladder will not be restored while the distention remains, is to be found in women after labour. When the child's head descends into the pelvis, it presses the urethra, and the urine is accumulated in the bladder. The woman, perhaps, after a tedious labour, is delivered. But now that the obstruction is removed, the urine does not pass, the bladder has lost its power, and the abdomen is distended as if the child had not been delivered.

The circumstance which most deceives the ignorant, in the paralytic state of the bladder, is that during its great distention there is a dribbling of the urine from the penis, which seems inconsistent with obstruction. The patient now expresses no desire to pass the urine. The attendants express their satisfaction, and their fears are allayed when there is most cause for alarm.

Next to this fact that the urine will be coming incessantly away while it is accumulating in the bladder, it is most important for the surgeon to know the symptoms of danger which do not evidently point to the occasion of them. Thus, when after much suffering there is a delirium or phrenzy, the patient is in the utmost danger, and the stupor which succeeds this is even more alarming. Then, indeed, it is necessary immediately to evacuate the urine, and soothe the viscera of the pelvis by anodyne clysters.

During this insensible flow of the urine, the distention of the bladder still increases*, and at last the bladder gives way, and the urine is sent abroad in the peritoneum, and certain death is the consequence.

I have seen what is called the ruptured bladder, from distention; but I formed a different opinion of its nature from that which is commonly described. I conceive it to be neither a rupture, for then the bladder would be rent, nor a mortification and sloughing, like the uterus when it is ruptured; for in that case how comes it that the hole is so small? It appears to me more to resemble a small ulcerated hole, with black edges; an ulcer similar to that which is formed behind the stricture of the urethra. But in the present case the bladder being distended to its utmost stretch, the irritation produces this ulcerative process in the fundus of the bladder, which is the most distended and the weakest part. The intestines gangrene from distention; but the appearance is very different in the bladder.

I have in many cases dissected out the bladder of patients dying of suppression, where the bladder was not found full of urine, though much enlarged and thickened. But in these cases the high degree of venous vascularity, and the turgidity of the vessels with very dark blood, was particularly to be noticed.

* It must have been in this way that a distended bladder was mistaken for dropsy of the cavity of the abdomen, and Mr. Hunter employed to tap the belly in the usual way. Observations on the Diseases of the Prostate Gland, by Sir Ev. Home.

This is an important fact, it reminds us that there is an obstruction which will wear out the patient and prove his death, without being so absolute as to produce a great distention or rupture of the bladder. There is another cause of death in the distention of the ureters and pelvis of the kidneys impeding the secretion of urine from the kidneys.

The last occasion which I have enumerated of introducing the catheter, is the enlargement of the prostate gland. In this case, the patient is sensible of a tumour, and feels as if the fœces distended the lower part of the rectum. The fœces are discharged compressed by the tumour. The tumour is distinctly felt by the finger in ano. This disease, peculiar to old men, is the most perplexing and most fatal cause of obstruction of urine. There is a partial disease of the prostate gland, which I shall treat of more particularly.

In fistula in ano, when the disease is in its commencement, and inflammatory, the neck of the bladder is sometimes affected, or the sinuses running forward in the perineum, or by the neck of the bladder, compress the passage, and obstruct the urine. Here the tension and swelling is to be subdued by bleeding, and anodynes, and fomentations, and the catheter, if possible, is to be avoided.

Previous to attempting the operation of the catheter, sometimes in the interval of ineffectual attempts to pass that instrument, or in cases of inflammation and irritation upon the urinary organs, even after the urine is evacuated, it will be

necessary to soothe and relax the parts. The means within our power are these; bleeding in the arm, or bleeding by cupping on the loins; clysters of starch, oil, and laudanum; the tepid bath and Dover powders, with an increased proportion of opiate.

TO DRAW OFF THE URINE BY USING THE BOUGIE.

Place the patient upright against the wall, or supported on his knees in bed: take a wax bougie, oil it, soften it, give it the proper curve to pass the turn of the urethra, introduce it into the bladder; now make gentle pressure above the pubes; make the patient exert himself to discharge the urine; sprinkle cold water on his thighs; withdraw the bougie while he continues the effort; and when he has the sensation as if he could pass the urine, withdraw the bougie altogether, and the urine will flow.

If there should be a stricture preventing the introduction of the catheter or of the bougie, the patient may, nevertheless, be relieved by the operation of the bougie, and time obtained for soothing the bladder, or destroying the stricture.

Place the patient as before; take a small bougie; introduce it into the stricture; press gently for some time, until the bougie, if it be soft, has moulded itself in the stricture; or, if it be of catgut or elastic gum, until it has entered and wedged itself into the stricture. Now press gently upon the belly; make the patient exert

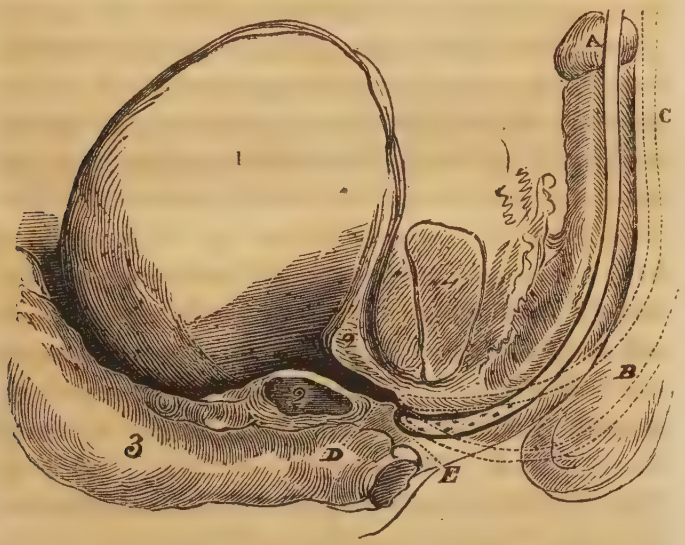
himself to pass the urine; throw cold water on the thighs, and slowly withdraw the bougie: the urine will generally follow the bougie.

OPERATION OF THE CATHETER.

THERE is a very important observation of Sir Everard Home, viz. that the catheter, intended to pass into the bladder in the case of obstruction from the prostate gland, ought to be of the largest size. The surgeon should have silver catheters of various sizes and curves. The general fault of these instruments is the great length of the extremity beyond the curve, which makes it difficult to accommodate the instrument to the curve of the urethra. I acknowledge at the same time, that a catheter with a large curve, and the extremity extending a good way beyond the curve, may be sometimes wanted.

The patient is placed against the wall, or laid in bed, or sitting with his breech over the edge of the chair. The catheter is laid for a little time in warm water, then oiled, and held with the wings betwixt the thumb and the fore and middle finger. The penis is held behind the glans, with the fingers of the left hand. Resting the edge of the hand on the belly of the patient, the point of the catheter is introduced into the urethra, with the concavity of the instrument towards the pubes. It is then glided down into the urethra, there being no difficulty nor obstruction until the point passes the bulb which is hung under the arch of the os pubis. Here an obstruction is generally felt, and the point of the in-

strument is felt to overcome some resistance, like that of a membranous projection. This I conceive to proceed most generally from the point of the catheter lodging in the dilatable sinus of the urethra, before the membranous part, and where the urethra is tied to the arch of the os pubis, as at F, or just before the prostate gland at D. If it proceeds from the first of these causes, then often the mere depression of the handle of the catheter (as B) will not disentangle the point; for the membrane rises with it, and opposes a further barrier to its entrance into the bladder.*



* This subject is more accurately treated in the *Engravings from Morbid Parts, contained in my Museum* in *Windmill-street. Folio. Longman.*

Explanation of the Plate of a Section of the Pelvis.

1. The bladder. 2. The prostate gland. 3. The rectum. 4. The os pubis. A, The catheter, introduced into the urethra, but obstructed at

The catheter must be withdrawn for about a quarter of an inch, and the whole catheter drawn closer up to the arch of the os pubis, and then carried forward. In this way it will seldom fail to enter. What I mean is perhaps to be better understood from the plan, where A is the catheter obstructed, while C is in outline the catheter, in a higher elevation in which it is to be carried forward; while depressing it, as in B, often does not succeed. But both ways will of course be tried.

There is a manner of introducing the catheter, with the convex side upward. In objection to the practice, I would offer these remarks:

1. Obstructions to the passing of the catheter, both in a natural and in a diseased state of the canal, are more generally on the lower than in the upper side; and this way of introducing the catheter, with its point turned downward, exposes it to the obstruction of every irregularity. 2. But I believe that, in general, no bad effect results from this manœuvre; for the point of the catheter does not commonly reach the obstruction until it is brought round to that position which it would have had, if introduced in the simple and common method.

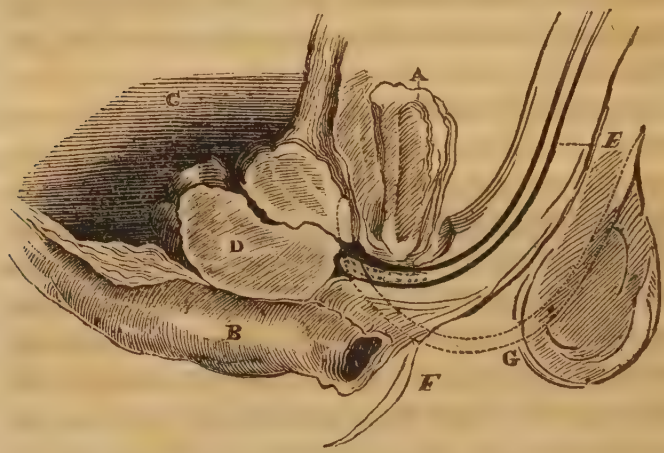
F, the handle of the catheter is depressed, so that the instrument comes into the position of the dotted line B; still the point remains. C is the position of the catheter when it is drawn up towards the pubes, when it is to be moved directly onward in the course of the dotted line, until it enters the neck of the bladder. D is another point at which the catheter is sometimes obstructed. See next plate.

3. In the description of this operation, it is expressly enjoined, that while we take a large sweep with the catheter, not suddenly but slowly, we must be careful to keep the point steady, and make it the centre of the whole motion; for it may otherwise take a new direction, different from that which it followed before. The question naturally arises, why is this turn given to the catheter, if the point is to remain precisely where it was? If this method of introducing the catheter had originally any meaning, further than to make a shew of dexterity, it was surely this, that the turn of the handle might give motion also to the point, so as to overcome the difficult turn of the urethra.

Le Dran gave us the injunction of studying to attain a correspondence betwixt the left hand, which holds the penis, and the right, which holds the catheter: he taught too, that the penis should be drawn upward upon the catheter. It has been observed, that the motion given to the penis cannot reach the point at which the obstruction occurs. It will, however, be found, that by pressing the finger in the perineum, and thus drawing the integuments forward, the course of the catheter is facilitated. But still more will it be possible to smooth the passage of the catheter, and direct its course, if the finger be introduced into the rectum. This last practice is in a peculiar manner necessary, when the difficulty proceeds from enlargement of the prostate gland.

The finger in the rectum informs us of the place, and often of the cause, of the obstruction. It enables us more freely to depress the hand, and elevate the point of the catheter, so as to direct it over the irregular swelling of the prostate gland, if, as it has happened, the urethra be distorted and compressed by it.

If, for example, the gland be enlarged chiefly on the lower part* (which I believe it generally is), then the urethra is raised up and elevated beyond the usual level, and the catheter, striking at F, is obstructed.



* Sketch of the section of the pelvis and bladder—

A, is the os pubis.

B, The rectum.

C, part of the distended bladder.

D, the enlarged prostate gland.

E, the catheter, with the point hitting on the fore-part of the prostate gland, at F.

G, the catheter depressed; but still it does not enter

The hand being now depressed, so as to bring the catheter to the position G, still its point does not enter the bladder, unless maintaining the footing and progress we have gained, the whole catheter be elevated, as in the outline C, and then carried forward horizontally, not in the axis of the curve of the instrument.

It will be in such distortions of the urethra, that the flexible catheter may be used with advantage. We either use the gum catheter without the wire, or we keep the wire in the catheter, and bend it so as to adapt it to the supposed obliquity of the canal; or, lastly, we withdraw the wire of the catheter from about an inch, or an inch and a half, from the extremity of the catheter, which gives some firmness to the instrument, and yet allows the point to be directed by the course of the canal, and to mount over any tumour or swelling which has produced the obliquity. Thus if the obstruction be of the nature represented in the last plan, or if there should be a tumour or excrescence from that part of the canal where the vasa deferentia open, the catheter with a flexible point will surmount it, and glide into the bladder.

PASSING THE CATHETER IN CASE OF DISEASED PROSTATE.

THERE is still another cause of obstructed urine, and a very common one, which requires great dexterity to overcome. I mean that from the enlargement of the third lobe of the prostate gland.

This disease seldom occurs till after the age of fifty: it may be called a disease of old age. It is a partial growth of the prostate gland, which produces a moveable tumour at the neck of the bladder. The root of this tumour is attached to the lower part of the orifice of the bladder on the inside, so that the body of the tumour being in the bladder acts as a valve hindering the egress of the urine. The distended bladder suffers a considerable increase in the lower and back part, and therefore being distended and stretched at this place by the accumulation of urine, the tumour is somewhat pulled back, and part of the urine is permitted to pass the orifice; but in this complaint the urine cannot be entirely evacuated: the distress is very great; the call to make urine frequent and urgent: he thinks he is expelling the last drops of urine because he expels it by violent exertion. But this exertion of the abdominal muscles is only pressing down the fundus of the bladder a little; by that means distending the lower and back part of the bladder, and thereby as it were lifting the valve-like tumour a little, so that there is a partial discharge of urine. Notwithstanding this frequent discharge of urine, the quantity in the bladder is actually increasing; and the tumour of the distended bladder may be felt with the hand, on pressing the patient's belly.

It will be found difficult to draw off the urine with the common silver catheter in this disease. If one is used it ought to be of the largest size, with

a full round point, that it may push back the tumour from the neck of the bladder and not catch under it, which a finer point is apt to do.

The elastic gum bougie is best adapted for passing into the bladder when the obstruction is owing to the swelling of the backmost and lowest part of the prostate gland. The surgeon must prepare the instrument so as to adapt it to turn over the convexity of the tumour. For this purpose he has to hold the catheter bent in a suitable form in water as hot as his fingers can bear; then he is to immerse it (still preserved in the same form) into cold water, the gum will then retain the shape. But it must be confessed, that the surgeon ought to have a variety of these catheters in his collection confined in proper shapes, so long that they will more faithfully preserve the curve during the operation.

The operation is to be conducted as already described. The catheter being soft and elastic, there is no possibility of managing it but by adapting the curve of the point of the instrument to mount over the obstruction of the tumour.

There is a means of directing the point of the catheter by introducing the finger into the rectum. At the same time that the point of the catheter is passing through the membranous part of the urethra let the point of the finger in, and oppose the extremity of the instrument: the elastic catheter being still pushed onwards, its point will rise over the finger, and taking a direction more

upward, it will pass over the tumour into the bladder; thus.

OF STONES IN THE URETHRA.

Stones may often form behind the stricture of the urethra, and prodigiously increase the irritation and the danger. In two cases, I have found on dissection that death was the consequence of a small calculus lodged behind the stricture. The surgeons, in both instances, remained ignorant of the circumstance. It was indeed the circumstance of these cases which put me on using the probe or sound more frequently; for by the common bougie, the presence of calculi cannot be so well ascertained.

In the case of a stone being behind the stricture, to introduce a small probe, and push back the stone a little, allows the urine to flow; and if in this manner the patient can abide the delay, the use of

the caustic may so far enlarge the urethra as to allow the stone to escape. But if the symptoms are pressing, and the irritation from the presence of the stone great, it will be better to cut upon it, and extract it.

We may here remark, that if the urethra be opened with the knife, it will quickly heal again, unless there be a stricture before this incision. In this case, having extracted the stone, we must immediately commence our operations against the stricture, otherwise our incision may become fistulous, from the difficulty the urine has to pass by the natural passage.

Often a small stone lying behind the stricture, by irritating, causes ulceration, and lodges there until it half sinks into the perineum; and sometimes, by slight injury (as the perineum being hurt on the saddle), an inflammation, ulceration, and abscess is quickly produced, and the stone is discharged by the perineum. When it lodges for some time in the urethra, it rapidly increases in size, from the urine passing over it; while it sinks down, and forms a sac, so that if the catheter be introduced, it slips into the bladder, and only grazes over the stone.

If a small stone be passing the urethra, where there is no stricture, it will lodge more frequently behind the bulb, or in the very extremity of the urethra, rather than any other part. Where there is phymosis, or stricture of the preputium, calculi sometimes lodge or are formed within the prepuce.

OPERATIONS TO RELIEVE STRICTURES IN THE URETHRA.

DARAN, a famous *practitioner* in diseases of the urethra, says in his introduction :—But why should I call in the assistance of the dead, when the living can witness and speak for me ? I am ready, says he, to convince the most incredulous of the nature of diseases of the urethra, by letting them feel them ! Now it is this kind of proof, which has deceived us for ages, and kept us so long very imperfectly acquainted with the nature of strictures in the urethra. I have grounded the observation I have to offer to my reader on a very different sort of evidence*.

Wherever anatomy has been steadily adhered to as the foundation of observation and reasoning in our science, that science has been progressive : it has been interrupted in its course, even amidst the most brilliant reputation of its professors, wherever men have arisen whose inventive powers have led them to reject, rather than to seek, the aid of anatomy.

OF THE VARIETIES IN STRICTURES.

1. THERE is a great inconsistency in following the same method of cure, in all strictures of the urethra, when it is demonstrable that there are many

* See Engravings from Specimens of Morbid Parts, preserved in my collection, containing specimens of every disease which is attended with change of structure in the urinary passages. Folio. 1813.

varieties in this disease. Besides the varieties of stricture discoverable on dissection, there are some other important peculiarities which appear to me not yet to be before the profession; and on which depends the efficacy or safety of the remedies to be used in diseases of the urethra.

2. I will not deny that stricture has very often the appearance described by Mr. Hunter, as if a thread were tied round the urethra; and as if there were a membrane tucked, and hanging across the canal. In introducing the bougie, or probe, we feel the point start over the stricture so as to convey to us precisely this notion. This simplest form of stricture I have examined now very many times, by dissection, as may be seen from the number of preparations in my collection. When a stricture of this kind is of long standing, and has no inflammation or coagulable lymph around it, there is seen in the substance, or on the surface, of the membrane of the urethra, a pure white dense fibre. This small fibre is distinguished from the soft mucous and dilateable membrane of the urethra, by its resemblance to such filaments as form the texture of the common fascia: I call it the bridle stricture. The term *bride** of the French authors must have been applied to this appearance. I have observed that the direction of the fibre is not always in the circle of the canal, but often it splits and branches, and sometimes runs nearly longitudinally. Similar effects to this

* See La Faye's notes on Dionis.

are seen in other membranes to be the effect of inflammation, particularly in the peritoneum. I observe this kind of stricture to be very frequent, if the urethra has not been disturbed by the operations of the surgeon.

When this stricture is newly formed, and the inflammation continues, there is around the firm line of the stricture a thickened base.

If inflammation occurs as a consequence of this stricture, the stricture itself not only increases, but the passage is apt to be further choked by a crust of coagulable lymph which forms behind. Through this crust, as it is forming, the urine makes its way, and forms a hole corresponding with the stricture. Indeed I have proofs before me that the new membrane will become consolidated, apparently by successive attacks of inflammation behind the stricture, and, at last, will form of this simple stricture one more irregular.

3. Much has been said formerly of stricture in the urethra being the effect of ulcer; and in truth a cicatrix.* When Dr. Hunter proved that a purulent discharge might come from a surface inflamed, though not ulcerated; and that in gonorrhœa there is no ulceration of the urethra, the question was held to be put to rest. Gonorrhœa was not imagined to be the cause of stricture. Stricture was supposed to proceed from muscular contraction, and the connection between the original disease and its consequences was almost

* Dionis and Saviard, and others.

forgot. Stricture, though occasioned by inflammation, will yet be produced without ulceration. But I cannot shut my eyes against the fact presented to me by dissection. I have found a firm stricture, in the centre of which there was an excavation by ulceration: and we must conclude that either the stricture must have ulcerated, or the original ulcer must have hardened, so as to condense the surrounding cellular membrane, and produce a very firm cicatrix and consequent stricture.

4. A narrowness of the canal, obstructing the point of the bougie, and giving, on examination, in the living body, the exact feeling of a common stricture, frequently proceeds from an inflamed lacuna. More general inflammation of the membrane of the canal may have subsided, but still the patient will be able to squeeze out a little thick purulent matter. From there being no active disease of the urethra, the surgeon will naturally think of introducing a bougie, and the point of it may suddenly be obstructed, so as to give the idea that there is a full circular contraction of the canal. We may often ascertain the nature of this case by examining with the finger on the outside. We feel a small hard body like a seed, or pea, within, or rather attached to the canal. When this part is pressed, a little purulent matter may be pushed to the point of the urethra. If a soft bougie is introduced, in order to take the impression of the stricture, a flatness will be perceptible on one side of the bougie. If a small bougie, or

probe, be introduced, its point may be made to hitch or lodge in the little sac or follicle.

One of the common lacunæ of the urethra, provided for the secretion and lodgement of the mucus, which is sent before the urine for lubricating the canal, has become the seat of gonorrhœa, or of that chronic inflammation which succeeds to it; while the inner surface of the lacuna has assumed the suppurative action, the surrounding membrane has become condensed, so as to lose its elasticity, and the canal of the urethra is consequently incapable of dilatation at that part.

5. The idea of seeing a stricture of the urethra is somewhat ludicrous; but the fact is, that there is a stricture of a very obstinate nature, which forms just within the lips of the urethra. I have seen it in every possible degree, and in some examples of a grey or ash colour, and hard as cartilage.

6. There is no case in which the surgeon is more apt to be confounded, than when a patient comes to him with a stricture which easily yields to the pressure of the bougie. He finds that there is at first a distinct resistance to the point of the bougie, but that the stricture is not firm, nor the sides of the canal callous. He finds that although at first he has difficulty, yet by introducing a succession of bougies he is able to pass the largest bougie with ease, and the contraction seems to be destroyed. But although the patient sees a large bougie introduced into his urethra, and cannot persist in saying that he

has a stricture, he allows himself to be persuaded in opposition to his feelings ; for his uneasiness continues, and, after a few days, he returns in his former condition.

7. All strictures are attended with symptoms which would incline us to believe that they are liable to spasmodic contraction. But the profession seems to entertain an opinion that there is a stricture more highly irritable, and in which the capacity for muscular action continues : that this muscular stricture, contracting in a degree, produces difficulty in passing the urine ; and that the contraction is occasionally, in a much higher degree, producing total obstruction. As I deny that stricture ever arises from this muscular contraction, I, of course, cannot believe that there is such a thing as a stricture possessing muscular power. And, if I use the term spasmodic stricture, it is only as implying that stricture which is attended with inflammation ; with high sensibility in its surface, or in the neighbouring part of the canal ; and that this sensibility is attended with a morbid irritability of the surrounding muscles. The character of this stricture is, that the obstruction seems occasionally to give way ; that there is great pain and irritation on introducing the bougie into the stricture, with heat of urine, fulness of the perinæum, and frequently total obstruction for a time. The variations in the capacity of passing urine, while yet the stricture was of a hard and rigid nature, soon brought me to the conviction that the term spasmodic stricture,

as generally used, was improper ; that there was no such thing as a muscular power in the stricture itself.

8. I have dissected the urethra where a sharp stone had stuck in it. The effect of this was to produce stricture. But although, during the life of the patient, the resistance of the urethra to the progress of the stone forward was such (the case being mistaken) as to destroy him, it was difficult to preserve any thing of the appearance of stricture in the preparation. It was not a permanent stricture, but an immediate effect of the loss of elasticity in the inflamed canal and surrounding membrane. A little soaking in water removed all appearance of stricture in the dead parts.

9. A small stone formed in the bladder may be retained behind a stricture ; but we must also be aware that a small and rough stone passing along the urethra will inflame it, make it incapable of dilatation, and, in short, produce stricture. This stricture, however, it will be very possible to dilate rapidly by the use of the bougie, so as to permit the stone to be discharged by the impulse of the urine.

See what is said upon this subject, p. 52. ; and also what is delivered under the head Of Extraction of Bodies lodging in the Urethra.

10. Stricture is sometimes, as already observed, seated just within the mouth of the urethra ; more frequently about an inch and a half down, and in the seat of the original inflammation of gonorrhœa.

or where the penis takes a sudden curve in hanging from the pubes. And lastly, it is very often found near the bulb, either immediately before the sinus of the urethra, or at the termination forwards of the membranous part of the canal.

11. I do not see any reason for rejecting the term callosity; the fact being that, both in dissection and in the examination of a patient, there is evidence of a considerable portion of the canal having become firm and almost of cartilaginous hardness. The notion commonly entertained of these long strictures or callosities is, that there have been two strictures, and that, the intermediate portion of the canal being no longer distended with the urine, the channel has diminished. This is the explanation given by Sir Everard Home in his excellent treatise. But it does not accord with the circumstances. For example, I have lately examined the parts where the stricture had absolutely closed so that not a drop of urine passed along the urethra. The bladder had been punctured, and the man lived for years discharging his urine by the puncture. Here it was curious to observe that the part of the urethra, anterior to the total obstruction, was wide or dilatable as in the natural state of the parts. It is evident, therefore, that the mere cessation of the usual distension of the urethra will not be followed by stricture or permanent contraction of the canal. These callosities, or long strictures, are always irregular; and this irregularity cannot be accounted for on the supposition that the canal at this part has be-

come rigid for want of the usual distension of the urine. I entertain no doubt that these contractions of the urethra, which extend to a considerable length of the canal, are produced by more severe attacks of inflammation than those which produce the common stricture. This sort of callosity of the canal differs from the more common stricture in this, that in consequence of the spongy body, which surrounds the canal of the urethra, often partaking of the effect of the inflammation, the cells are obliterated; and what was loose, spongy, and dilatable has become condensed and rigid. This undilatable condition of the urethra, when examined by the bougie, or probe, gives the sensation of great irregularity; the point is interrupted, and feels as if it were moving over eminences on alternate sides of the canal. When the ball probe, or urethra sound, is introduced through the anterior part of the stricture, there is difficulty in pushing it down, and a slight impediment is felt in retracting it.

12. It is in these callous strictures that the false passage is apt to be formed; and this wrong direction is as apt to be taken by the bougie simply as when the caustic is applied. I dissected the parts, where I found an irregular stricture near the bulb of the urethra, and by the side of the stricture a passage of an inch and a half in length in the spongy substance of the urethra. This canal was smooth like the natural urethra. It was curious to find on inquiry that the patient had experienced

relief by the introduction of the bougie into this false passage.

13. There is a state of the canal in which a considerable portion is diminished in width ; and which does not fall under any of the foregoing distinctions. I have found, on dissection, from two to three inches of the canal much diminished in capacity, and rigid ; and all around this part of the urethra the spongy substance obliterated. The effect was, as if the urethra and spongy body had suffered by compression ; yet this could not be the case, and at present I do not pretend to explain the cause.*

14. Where there is stricture in the urethra, that portion of the canal which is betwixt the stricture in the urethra and the bladder is much enlarged. When the patient has died, in consequence of stricture and an acute attack of inflammation, I have found the whole extent of the urethra inflamed, but chiefly that portion which lay between the stricture and the bladder. There a firm coat of coagulable lymph was deposited, which hung fleecy into the dilated cavity

* On dissection, or in practice, I find nothing confirming the idea of a spongy swelling of the membranes of the urethra, similar to the state of the mucous membrane of the nose in Coryza. (See Petit and Arneau.) The idea has probably arisen from examining the dilatable stricture. *Embarras vasculeux.* This is a term of Goulard : he is angry with writers for neglecting it, and has found it in practice and on dissection. It is that state of the urethra where there is much veinous vascularity, and which bleeds readily on the introduction of the bougie. He thinks they are occasioned by the spasms : a spasmodic state accompanies them.

of the canal. Under this inflammatory crust, the proper surface of the urethra was highly inflamed. In another instance, where I was ignorant of the manner of death, I saw behind the stricture a patch of coagulable lymph, and considerable inflammation around it; but in the part of the urethra anterior to the stricture, there were no marks remaining of inflammation.

In the instance of a gentleman, who resisted all means of cure, and who died of inflammation of the bladder, the coagulable lymph formed a dense coat to the inside of the urethra, behind the stricture, so as to close the seminal ducts and mucous follicles.

On examining the prostate gland and urethra behind the stricture, I have seen great disorder. Before the irritation produces ulceration and fistula, cavities are formed in the sides of the canal where it passes through the prostate gland. These cavities I believe to be only enlargement of the natural ducts of the gland. I have seen them so large as to admit the end of the largest bougie in size. Having observed that, in bad cases of fistula in perinæo, the urine came from the neck of the bladder and prostate gland, I am inclined to believe that these cavities in the side of the urethra and prostate gland sometimes ulcerate, and produce the worst kind of fistula, because they receive the urine direct from the bladder, uninterrupted by the action of the sphincter. The incessant infiltration of the urine into the cellular texture of the perinæum is probably the cause that

in most cases of the kind which I have seen there was extensive mortification.

I have found in the neighbourhood of a stricture a very minute crop of soft warts growing from the membrane of the urethra.

15. On the bladder the effect of stricture is always manifest. If the difficulty of passing the urine has been long continued, the coats of the bladder are very much thickened; apparently by frequent lesser degrees of inflammation, but principally from the necessity of increased force in throwing out the urine, and the consequent increase in strength of the muscular fibre. When the patient has been cut off by irritation more rapidly, I have found the fundus of the bladder, on the outside, loaded with blood, and black with a congeries of turgid vessels; on the inside, masses of coagulable lymph, and, in the interstices, the natural surface loaded with blood. If, by accession of inflammation in stricture, absolute obstruction comes suddenly, the bladder suffers an extraordinary degree of distention until the urine at last escapes into the cavity of the abdomen. On examining the fundus of the bladder, I have seen dark spots upon it, and in the centre of these dark spots small ragged holes. If the bladder had burst, it would have appeared rent. It has happened that the bladder has been rent by a fall, and in that case the hand could be put through the rupture.* If it had gangrened, it would have

* Medical Comm. vol. 2. Bonet. Sepulch. lib. iii. sect. 24. obs. 12.

been black over a greater extent, and inflamed like a gangrened intestine. But as there were more than one small hole, I conceive that the urine escapes from the fundus of the bladder, as it does from the urethra in the more common case of fistula in perinæo, that is, by ulceration. Sometimes, it would appear, the urine escapes from the bladder without the outer peritonæal coat giving way; then the urine insinuates itself extensively into the cellular substance behind the peritonæum. A case of this kind has been communicated to me.

16. The effect of stricture on the ureters is to enlarge them in a remarkable degree. I have seen them as large as a small intestine, and much inflamed.

17. On the kidney, the effect of stricture, or any other kind of obstruction to the course of the urine, is very remarkable. It suffers great distention; the surrounding cellular membrane is inflamed; the substance of the kidney itself is inflamed; and the pelvis, with its digital processes, is greatly distended, and the vessels turgid with vermilion-coloured blood.

18. The effect of stricture on the bladder, ureters, and kidneys combined, brings on fever, with great irritation, from which at last, there results an effusion on the surface of the brain.

If these distinctions in the nature of stricture, drawn from appearances in the dead body, are important, it is of course equally necessary to learn to distinguish them in practice.

OF SOUNDING THE URETHRA, TO ASCERTAIN THE PLACE AND EXTENT OF THE STRICTURE.

As in a natural state the orifice of the urethra is the narrowest, or rather the least dilatable part, we must, in the first instance, adapt the size of the bougie to it. It is a general position, that the larger the bougie, the risk is the less of its meeting with any accidental interruption*, and consequently there is the better assurance of its stopping at a stricture only.

Having dipped the bougie in oil, it is introduced a little way into the urethra. Then the penis should be moderately stretched with the left hand, and held steady ; when, with an easy unrestrained motion of the wrist and fingers, the bougie is to be introduced. The motion ought not to be too slow, nor, on the other hand, should the bougie be harshly introduced, for in either case the resistance and size of the urethra is not so easily felt. Sometimes there is felt only a degree of hesitation and difficulty in the bougie passing the first stricture, while it sticks fast in the second.†

When with a bougie of the largest size we are opposed by a firm stricture, we mark the depth of

* The bougie, when very small in the point, is very apt to catch on the lacuna, and on a fold of the urethra, when it is making the curve under the os pubis.

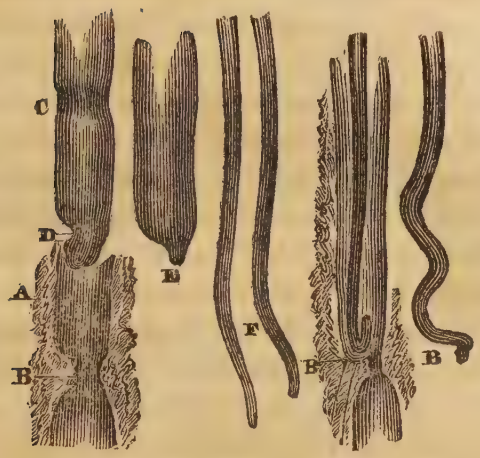
† We cannot examine the urethra properly with a conical bougie ; for it will be wedged in the first stricture, which feels like the opposition of a second.

the stricture on the bougie, and, withdrawing it, take successive smaller ones, until we find one which passes the obstruction, when we proceed to examine the whole extent of the canal.

Supposing that, disappointed in passing the larger bougie, we introduce a smaller one, and it does not pass, when withdrawn, it may have the point turned directly backward, in which case it has hit upon the angle made by the stricture (B, fig. 7. of next page), and it has been directed across the mouth of the opening, so as to be reflected on itself. If it has been pushed against the opening directly, the point will infallibly shew some appearance of its being moulded to the stricture, perhaps sharpened, as in fig. 8., the point having entered into the stricture. The curve B will be a direction by which we have to make the succeeding effort, as it shews us how the permeable part of the canal is removed from the direct line. The point may be cut by pressing directly against the bridle of the stricture, as represented in fig. 4. p. 70. The small filament makes the deep cut A, and leaves two projecting points.

When obstruction is felt, which our bougie, with moderate perseverance, will not pass, we have recourse to the soft bougie, to take an impression of the stricture.

Fig. 7. *Fig. 8.*



The *soft bougie* is used to take an impression of the stricture, in order in some measure to ascertain its degree and extent. The bougie is oiled and heated so as to take the due curve adapted to the urethra: just before using it the point is dipt into warm water to soften it. It is then to be introduced and carried down to the obstruction, and allowed to remain there; it is pressed with a very steady hand into the stricture, where being allowed to remain a little time, it takes the impression of the stricture. Upon withdrawing it, we have a cast of the stricture; and we are now enabled to pass a bougie curved upon the model of the soft bougie. It teaches us also to apply the caustic with effect.

In this plate I have represented the plan of a stricture, let A B represent the urethra, C D the bougie. Suppose that the soft bougie is pressed into the stricture, then the greater projection of one side of the stricture B has a corresponding in-

dentation in the bougie D, and by withdrawing the bougie without twisting it at all, we learn where the caustic is to be applied, or how the point of the bougie is to be bent in order that it may pass.

Again, when we are endeavouring to pass a small bougie, suppose that the point shows a projection, as E, we know that the opening is very small, and to the right side. We accordingly give the small bougie the curve F, which throws the point into the direction of the orifice of the stricture.

Fig. 1. *Fig.* 2. *Fig.* 3.

Mr. Hunter, with his usual correctness, has said that a stricture is of very small extent, and resembles the effect of tying a thread round the canal. But this fact I think has been proceeded upon too blindly. Before the caustic is used, a very accurate survey of the canal should be made. I have now to propose the use of probes, which give, I conceive, much more accurate information of the extent of the stricture than the bougie. In

fig. 1. of this plate there is a plan of a common stricture, and in fig. 3. we have the point of the bougie introduced into such a stricture. If this bougie had been of an equal thickness in all its length, it would have passed the stricture with a uniform degree of difficulty. But as it is conical towards the point, it has only entered the stricture, and sticks there; and when softened, it begins to yield and curve in the upper part of the urethra, giving a deceitful sensation of still proceeding. In neither of these cases is any information conveyed to the operator of the extent of the disease. And although very often the contractions are merely such as are represented in fig. 1. and 3., yet I am well assured that they are often far from simple; that there are irregular contractions for half an inch or an inch in length, in which case there is a very considerable danger of the caustic being applied so as to make a wrong passage.

To ascertain the extent of the stricture, I procured a series of silver probes with circular knobs (as represented in fig. 1. and 2.), the knobs varying from the full size of the urethra to what will just pass the narrowest stricture. By successively introducing smaller balls, I ascertain the degree of stricture by the ball which passes easily, and I am secure of being in the passage by passing the probe onward when it has got beyond the stricture. And by the slight feeling of resistance in passing the ball, and in withdrawing it again through the obstruction, I ascertain the extent of

the contraction. If the ball of this probe be liable, like the point of the bougie, to enter one of the lacunæ, or, passing it, to rub upon the edge, yet by feeling whether the same roughness or difficulty attends the withdrawing of the bulb of the probe, as when it passed downward, we may be assured whether there be a stricture and callossity of the canal, or whether the obstruction be not caused merely by the lacuna; for as the lacuna are directed with their openings towards the orifice of the urethra, their edges cannot catch the probe in withdrawing it, and, consequently, unless there be a disease there is a uniform smoothness in withdrawing the instrument,

Again, in fig. 2. there is an irregular hardening of the urethra for a considerable extent, along which the probe moves with hesitation and difficulty, while in fig. 1. having passed the obstruction, it moves on with freedom. These balls then ascertain the nature and extent of the stricture.

I give importance to this knowledge of the extent of the stricture, because I believe that the practice and method of cure ought to be varied with the circumstances. With the bougie we are seldom able to ascertain the number and probable obstinacy of the strictures below the first; while with this instrument, the ball passing the first stricture, we are enabled, from the fineness of the wire, round which the stricture cannot close, to examine the second stricture with equal facility as we did the first.

But this instrument, the *urethra sound*, has enabled me to make observations on the urethra,

as it is the seat of inflammation and a morbid sensibility, as well as of strictures. In the treatment of diseases of the urethra, it is of the first importance to know the presence and extent of the inflammation.

OF THE BOUGIE AS A CURE FOR STRICTURE.

The too sanguine favourers of the application of the caustic in stricture have misconstrued the operation of the bougie in this disease, when they say it operates like a wedge merely, and dilates the passage. By the pressure of the bougie, an action is excited in the stricture, and the activity of the vessels adapts the form of the canal to the state of dilatation.

The bougie can never be laid aside in practice: in very many cases it is sufficient to remove strictures; and when the caustic is used, we also require occasionally to make use of the bougie.

It was formerly a practice to introduce a firm bougie, to press it against the stricture, and then to tie it in its place, so that the forcible impression was continued until the part ulcerated under the point of the bougie. This is a practice never to be imitated: a false passage is almost a certain consequence.

The operator has first to measure accurately, with a common sized bougie, the exact place of the stricture; then, taking one of a conical form, he marks upon it the depth of the stricture, by comparison with the other. On introducing it, he

knows that no lesser obstruction short of the insertion of the bougie to the full depth, as already marked, can be the stricture. He now presses gently, and ascertains that he has introduced the bougie into the stricture, by its sticking when he slightly attempts to draw it back ; and when it gives the feeling of having passed the contraction, he can ascertain the fact, by quitting his hold of the bougie, and observing whether it recoils, and rises a little from the urethra ; for it does so when it is bending in the canal, and not entering the stricture.

Upon withdrawing the bougie, and examining the point, we have to observe whether the end be blunted ; in which case either the stricture must be close indeed, or it must have struck on the angle formed in the urethra by the prominent stricture. If the bougie is sharpened or flattened towards the point, it has probably entered the stricture, and we are made certain of this, if there be a defined circular impression round the bougie, at a little distance from its point.

The time that each bougie should remain in the passage must be determined by the feelings of the patient.; for it should never give pain if possible. At first, a few minutes (in an irritable urethra) may be sufficient. If the stricture retains any degree of the natural elasticity of the canal, we may proceed rapidly to increase the size of the bougie ; but when it is firm, a change of structure being a necessary prelude to our success, the pressure must be more gradually increased.

Here I must pointedly give my reader a caution in regard to the impression or nip which the stricture makes upon the bougie. The urethra is oftener injured, and dangerous irritation brought on, by drawing out a bougie rudely, than by forcing it into a stricture. When a soft wax bougie is used to dilate a stricture, as the wax softens, the edge of the stricture sinks into the bougie and grasps it so firmly that in drawing it out it is very apt to tear and injure the urethra. It is for this reason that the bougie should be drawn a very little, so as to shift its place from time to time, and to prevent the stricture making a deep impression.

It ought not to be concealed, that it is the practice of some in using the bougie forcibly to break down the stricture, and sometimes for this purpose a strong silver probe is used. I should imagine that the simple fact of the strictured part being the strongest and firmest (the most condensed) part of the urethra, should be a sufficient interdiction against this practice.

OF THE CAUSTIC.

The bad effects which may be brought on by the use of the caustic, are an attack of fever like the fit of an ague, high irritability of the urethra, hæmorrhagy from the urethra, swelled testicle, affection of the stomach with giddiness, and plugging up of the urethra by the slough.

I believe this is equivalent to saying, that the caustic must never be used without a pressing ne-

cessity for it, and that it is to be used with the greatest precaution ; and having said this, I am at liberty to add, that it is a remedy which cannot be too much prized.

I have been particular in describing the manner of ascertaining the exact place, direction, and extent of the stricture ; because I am too well assured that it is in this that the general practice is deficient ; all kinds and degrees of surgeons venturing in the slightest and in the most desperate cases to try the caustic without discrimination.

For the removal of a confirmed stricture with a sharp filamentous edge, or of any kind of confirmed stricture, my experience teaches me that the alkaline caustic is quite ineffectual. I have practised the use of the kali purum, and in some cases I have found advantage from it, but it was only in the greater case of introducing the bougie ; and the removal of the stricture, in every case, I have learned to attribute to the mechanical action of the bougie.

The supposition that the kali purum abrades and takes off the surface of the stricture appears to me to be without foundation ; that soap which is formed, is by the union of the caustic with the secretion of the urethra. By this union, and the mixture with the oil in which the bougie is dipped, the caustic is made mild ; and having the quality of lubricating the strictured part of the canal, it facilitates the introduction of the bougie.

The lunar caustic is peculiarly well adapted to destroy the firm and sharp stricture of small ex-

tent, which is the most common kind of obstruction. But there are strictures or diseased narrowings of the canal, extending to half an inch, or an inch in length, and irregular in their course. In these cases we must retain the use of the common bougie; for to attempt boring with the armed bougie through the firm strictured part of the canal for so great a length, when the surrounding parts are comparatively loose, is in a high degree dangerous.

The common kind of permanent stricture, which I have described under the term simple stricture, is ascertained, in the living body, by the use of the soft bougie, and by the circumstance of the ball of the probe passing down uniformly, and without obstruction, till it reaches the stricture; there meeting with resistance at last, passing with a jerk through the stricture, and then gliding smoothly onwards. This stricture is to be cured by the operation of the lunar caustic. A full sized armed bougie is to be passed down to it, so that the whole base of the stricture may be destroyed; after which the largest bougie may be carried freely into the bladder. It is the success attending the operation of caustic, in cases of this kind, that has brought this method of cure into such general use.

Let us observe what are the effects of lunar caustic on the urethra. When a part is touched by the caustic it does not at once become loose: the dead slough remains attached to the remaining part; and the obstruction* for the time is neces-

* The mechanical obstruction, not the spasmodic difficulty of passing the urine.

sarily greater. The obstruction is greater, because it is sufficiently evident that the union of the caustic with the substance touched produces a sponginess or expansion in it. It is by a change taking place in the living part that the dead comes off in a slough. This operation, the effect of an excited action of the living vessels, is necessarily slow. If the application of the caustic has been gentle, the dead matter comes away insensibly; or only some very small shreds or filaments are observed in the urine. If the application of the caustic has been more severe, a distinct pellet of slough will be pushed off with the urine about the fourth day.

As to the white matter which is attached to the lunar caustic on withdrawing the bougie, I know not what to think of a surgeon who can suppose this concrete to be a true slough. The matter discharged from the urethra in consequence of introducing the lunar caustic is of three kinds; 1. The coagulated secretion of the urethra which attaches to the end of the bougie; 2. Coagulable lymph; which is one effect of inflammation, and therefore an after process; 3. and lastly, The proper slough from the stricture or membrane of the urethra, which has been injured and disorganized by the operation of the caustic, and is thrown off by the living surface. Some authors have spoken of keeping the lunar caustic in the urethra for a few minutes, as if a minute more or less was of little consequence! I kept the armed bougie, as it is termed, one minute introduced into the

sheath, or prepuce, of a ram; on killing the animal on the fourth day, I found a deep slough, of double the diameter of the caustic employed, almost detached, and leaving a deep ulcer. I applied the caustic to the stricture of a young gentleman for a minute; on the fourth day his urethra was plugged, until the urine forced off a large membranous slough. It is the coagulated matter attached to the face of the caustic which prevents the entire destruction of the urethra, when the armed bougie is kept more than a minute in the canal.

Let my reader consider how it happens that, in certain cases on record, the caustic goes through the stricture even during its application as a caustic. Consider also the instances frequently mentioned, where the bougie is described as going into the bladder twenty-four hours after the application of the caustic. What can we understand to happen in such cases, but that the surgeon is deceived by the urethra permitting him to use more force than he could before the parts were deadened by the caustic.

In using the caustic bougie, we proceed in this manner: we take a bougie of the common kind, which we know to be adapted to the urethra; but the extremity of which will not pass the stricture. We take a caustic bougie of the same size and form; we then give them the proper bend to answer to the place of the stricture; we then oil them, and lay them by us, for if kept in the hand they lose

their firmness. Then taking the glans penis in the hand, the simple bougie is introduced with a uniform motion, until it meets the stricture. Having ascertained that the point bears against the stricture, a mark is made with the nail on the bougie, that the depth of its insertion may be ascertained. It is now to be withdrawn. The simple and the armed bougie are now placed together, and a mark with the nail made on the armed bougie corresponding to the place of that on the simple bougie. The armed or caustic bougie is now introduced with a uniform motion of the wrist and fingers, until it is opposed by the stricture; it is gently pressed, and a steady gentle pressure is to be continued for the space of a minute.

In the application of the caustic bougie to an old and confirmed stricture, there is often no pain experienced; and the pain and heat in such a case is the effect of the liquefaction of the caustic. Where there is a small bridle stricture, the bougie, as commonly prepared, must permit the caustic to touch some part of the natural surface, and there will be a burning sensation accompanying the application.

When the bougie is withdrawn, a soft white matter covers the surface of the caustic. This is not a slough, but is the effect of the caustic coagulating the natural secretion of the passage. This concreted matter sometimes remains in the passage until driven out by the urine. The patient is ever willing to believe this the slough of the stricture.

The proper slough generally comes away in small shreds with the urine. After a very severe application, at the distance of perhaps three days, the patient feels an unusual obstruction in the passage, and straining, he brings away the slough.

I have entirely given up that severity in the application of the caustic, which produces distinct slough and temporary obstruction to the urine; and I am now well convinced, that in the case adapted for the use of caustic, a slight application, that is a short continuance of the application, compared with the present prevailing practice, is quite sufficient for the entire destruction of the stricture.

When I meet with a case of bridle stricture, the filament of which cuts the wax bougie, I am in the habit of varying the manner of applying the caustic. The following is a very safe method.

Take a full sized smooth wax bougie; oil it, heat it, and give the due degree of curve to adapt it to the form of the urethra; introduce it down to the stricture, and continue to press it gently for some time. Withdraw it, without twisting the instrument, but, on the contrary, preserve its relation to the urethra, and take particular note of that relation; on examining the point, there is a deep cut upon it formed by the bridle stricture. Take now a small portion of the lunar caustic, and, opening the cut of the bougie which has been made by the filament of the stricture, place the portion of caustic in it. Again, introduce the bougie thus armed with the caustic, in the relation it formerly stood

to the urethra; and now the filament of the stricture, falling into the notch it has formerly made, will be effectually operated on by the caustic, without any of the heat or inflammation usually produced in the urethra by the use of caustic.

Almost every case of stricture in the urethra is attended with peculiar circumstances. Strictures vary so much in situation, degree, or kind, that it requires more discrimination than is generally bestowed in the preliminary steps and inquiries, as well as in the adaptations of the methods of cure. As improvements and new suggestions are offered us, we require, in justice to the public, to be jealous of our individual partialities; and in no instance, perhaps, is prejudice so apt to arise in favour of a particular method, merely because it is our own, than in the cure of strictures.

In former editions of this work, I have shewn considerable partiality for the use of the *kali purum* as a caustic in cases of stricture. I have used it a great deal. I have found it diminish the sensibility of the stricture. I have found it well adapted to lubricate the stricture, and facilitate the entry of the bougie. In short, I have found it assist the operation of the bougie in dilating the stricture, but I have not found it to be a caustic capable of destroying the sharp edge of a firm stricture, in any degree to be compared with the lunar caustic. I have therefore drawn my pen through all that I wrote in explanation of this method in any former edition.

In very obstinate stricture, attended with continued and ineffectual straining and violent paroxysms of fever, threatening the total overthrow of the patient's constitution, I have been induced to consent to a more speedy removal of the obstruction. In the instance to which I allude, there was a callous and intricate fistula in the perineum, about four inches and a half from the extremity of the urethra, a stricture of at least an inch in length, which was felt like a cord through the integuments of the penis; and up to this point the stream of urine came with great strength, distending the canal of the urethra to half an inch in diameter.

OPERATION.

A CANULA of silver was introduced down to the stricture. The patient then made an effort to pass the urine; and when the urethra was fully distended a stilette was introduced into the canula, and carried along the diseased part of the urethra, until it entered the dilated part of the canal. These being withdrawn, a bougie was introduced into the passage.

This, however, is a very difficult operation. To the feeling, nothing is more easy than to hit the lower part of the canal, but it really is very difficult. And when my opinion as to the manner of operating was afterwards taken in a similar case, I advised strongly that the stricture should be pierced from below, by first making an opening into the sound part of the urethra, and then passing the canula

and stilette upwards through the urethra, to the point of the penis.

I assisted Mr. Lynn, of Westminster, in the following case. A stout healthy young man had a stricture within an inch and a half of the extremity of the penis, of a full inch in length, quite firm and impervious to the urine, which passed in a free jet from the side of his penis. It was not a stricture from a common cause, but in consequence of a bruise. A small fistula lacrimalis probe was pushed with great difficulty down from the point of the urethra through the stricture. The end of this fine probe lying in the sound part of the urethra, was cut upon; then a common trochar and canula was, by the direction of this probe, pushed upwards to the point of the urethra. The stilette of the trochar was then withdrawn; and an eyed probe, with a large seton, was introduced through the diseased part of the urethra; and a catheter passed into the bladder from the incision.

The large skein of cotton-thread in the upper part of the urethra, produced profuse suppuration, and made a passage large enough for the catheter of the largest size. When the suppuration was fairly established, the catheter was withdrawn from the wound, and introduced in the usual method. In a very few days the wound closed, and the fistulous opening had entirely disappeared.

These are operations not likely to be repeated. I retain them here to shew that ingenuity and an occasional deviation from the common method of practice may be necessary, but with this remark

that I have not seen the case a second time that imperatively called for them.

ON THE DILATABLE STRICTURE OF THE URETHRA.

THERE is a very troublesome kind of stricture, which from its distinctive character I have called Dilatable Stricture.

The account which the patient gives of himself is nearly this: That, sometime before, he had a severe gonorrhœa; that being particularly circumstanced, he could not so well observe the directions of his medical attendant as perhaps the case required; that the disease continued long severe, and he doubts even now whether he be entirely well; for he has observed that, although the discharge sometimes disappears, and he is free from any uneasiness, yet occasionally the symptoms return; at which time he has been sensible of a fulness in the perinæum, while, even during the absence of the discharge, there is still a heat of urine; and he has imagined a diminution of the stream of urine; that of late the call to make urine has become frequent, and he is obliged to rise often in the night to make water; and that whenever he exceeds in wine, or takes unusual exercise, or has connection, the symptoms increase with a considerable discharge from the urethra.

Sometimes a patient comes to us with this complaint, imagining that he has got a recent gonorrhœa; but, although there be discharge from the urethra, there is no redness or swelling of the lips

of the urethra, or inflammation of the glans or prepuce.

When the urethra thus affected is examined by the bougie, it is found to be unusually sensible; and when we carry the bougie down to the stricture, there is severe pain, and the patient shrinks from the hand. If he allows us to persist, we shall be sensible of resistance to the point of the bougie; and if we force the instrument on, we shall feel it grasped as by a common stricture.

When the urethra-sound is used, as the ball is passed into the urethra, there is much increased sensibility near the glans; having passed the ball a little way down the canal, the patient ceases to complain of it; but when in its further progress the diseased part is touched, and the ball passes through the stricture, there is pain and a feeling of soreness.

This state of the urethra differs from that of proper stricture, in being less rigid and firm. If, after examining a patient, whose urethra is in this state, you call the disease stricture, and he happens to consult another surgeon, he will be told that it is no stricture, and to prove this, one of the largest bougies is passed with exultation! But this dilatation is not a cure of the disease; on the contrary, every unpleasant symptom is often aggravated by the violence which has been used.

The state of the urethra which I have here described may continue for a long time; the symptoms neither increasing in severity, nor altogether subsiding. I find patients to whom it seems

difficult to remember the time when they were entirely free from uneasiness and occasional discharge; and yet their complaints are not absolute, confirmed stricture, but only through a part of the canal the bougie passes with difficulty. When, however, the complaint is of long standing, there are often several parts of the canal inflamed; perhaps one of these spots gives proof of an unelastic and confirmed stricture having been formed. I have found a dilatable stricture deep in the urethra, and near the bladder, while there was a confirmed and rigid stricture near the extremity of the urethra. Indeed when there are two or three strictures in the urethra, we are sure to find some of them more dilatable than the others. The original and first formed stricture is firm, and the resistance it gives is abrupt; while the others partake more of the nature of the disease which I have here described. On one occasion, I found several parts of the canal inflamed, contracted, and unnaturally sensible: after the lapse of nearly a year, I found the anterior of these spots of the urethra confirmed into a rigid stricture, having lost that elasticity which enabled me by gentle and continued pressure to dilate it.

I have already observed, that if, in the circumstances described, I say my patient has stricture, he may probably be told by another surgeon that I have been deceived, and that there is no stricture in the case; and to prove this, the surgeon takes a large bougie and passes it directly into the bladder, regardless of the pain which he occasions.

It is by much too common an error to force a bougie into the inflamed urethra; and surgeons are induced to this, from the appearance of greater skill which is given by the dextrous introduction of the bougie, where others have failed. Sometimes indeed a young man, ignorant of the structure of the urethra, introduces a bougie with a small point, which he allows to enter into one of the lacunæ, or to hitch against a fold of the urethra under the arch of the pubis. A surgeon, aware of the possibility of this failure, and well instructed in the anatomy of the parts, gives to a large bougie its proper curve: turns up the point of it, so that it escapes the fold of the urethra on passing under the pubis; and thus with real dexterity introduces a very large bougie where others have imagined, and made the patient believe, that there was a stricture. But it is quite a different matter when the surgeon forces one of his large bougies through a urethra narrowed by such a stricture as I have described above. This unmeaning cruelty, in driving in a bougie by main force, is generally followed by great increase of the discharge, sometimes with absolute obstruction of urine. I am not to learn that the disease which I have described may be cured by the use of the bougie alone; but it is not in this way that we are to proceed. Even in a healthy state of the urethra, the introduction of a very large bougie will produce a violent inflammation and discharge.

If we consider the structure of the urinary canal, and the effects of inflammation, together

with the history of this complaint, which I have called the dilatable stricture, we shall have no difficulty, I think, in forming an opinion of the state of the part when thus diseased. The urethra is a dilatable tube, but it has in itself no power of expansion. It is distended only by the force of the bladder, and by means of the urine flowing from the bladder; and to facilitate this operation it is elastic, and very easily stretched. Inflammation changes the natural structure of all the parts of the body; the hard bone by inflammation becomes soft; the firm tendon becomes spongy; the transparent membrane becomes thick and opaque; and pliant parts become firm. So when the urethra is inflamed there is a diminution of its natural elasticity; and a greater force of the bladder is necessary to the discharge of urine through the inflamed part of the passage. When the general state of inflammation of the urethra subsides, if it has not been violent or of long continuance, the membrane resumes its pliancy. But it often happens that a part of the canal continues more permanently inflamed; a residue as it were of the more general inflammation. This part does not yield to the impulse of the urine (and the urine being of necessity driven more forcibly against this contracted part, is, no doubt, one cause of the continuation of the inflammation), and the bougie which passes easily along that part of the canal which is not inflamed, is resisted by this inflamed part of the canal. I had almost said by this contracted part; but the word *contracted* is

improper as applied to stricture of the urethra, for the sides of the urethra are always in contact, and cannot be brought closer by the formation of a stricture. A stricture is only a loss of elasticity, which prevents the due distention of the part when the push of urine is made, or the bougie is introduced.

The obstruction to the passing of the urine, of which I have detailed the symptoms, must be occasioned by this loss of elasticity—this inaptitude of the canal to dilate, which proceeds from vestiges of inflammation in a part of the canal, after a more general inflammation has subsided, and which attaches to distinct places of the canal.

In proposing a cure for this disease, we should naturally suppose it possible to remove it, by putting the patient upon low diet; confining him to his sofa; leeching the perinæum; fomenting or applying wet cloths, &c. I shall not say that this practice may not be beneficial in some cases; but I am also well assured, that the patient may be long confined and greatly reduced, and yet after all derive but slight and temporary benefit from this severe treatment.

In the use of the bougie, we have the means of applying pressure, and at the same time distending the inflamed membrane; by which the low chronic inflammation is disturbed and remedied. Being assured that the violence of inflammatory action is gone, if it ever was violent, we take a large sized bougie, introduce it, and press it until it passes the stricture; we let it remain there two or three

minutes. On the fourth day we introduce it again ; and this is repeated until the bougie passes without pain, and the stream of urine is full. But the use of the bougie in this state of the canal is a painful remedy. Sometimes the inflammation does not diminish, but is greatly increased, and there follow swelled testicle and all the train of distressing symptoms, which delay the cure and irritate the patient.

But in this effect of the bougie, in the case of dilatable stricture, there is much which deserves my reader's attention. Some very incorrect opinions are received and acted upon, which have no foundation but in this fact. Some have advised that the stricture of the urethra be forcibly torn up by the use of a metallic probe, and they have successful instances to bring in vindication of the practice. So have surgeons in all ages brought cases to vindicate their practice and substantiate their opinions. Formerly it was no uncommon practice to break down the carunculæ and fungous excrescences of the urethra ; and the cases given in former times, to prove the presence and destruction of carunculæ, were just as worthy of credit as those now brought forward to prove the possibility of breaking through a stricture. The stubborn fact which opposes our belief, is that the confirmed stricture is the firmest and densest part of the canal, and we cannot thus break through it. Doing what the old surgeons supposed had the effect of bruising the carunculæ, that is, pushing a probe or bougie into the urethra, has the effect merely of stretching and doing

violence to a dilatable stricture; and the issue of this is for the most part beneficial. When this same process of cure is tried with a firm and rigid stricture, the consequences are, intolerable pain, inflammation, and spasm.

The explanation of the effect of this practice which I have to offer is this, viz. that it is the pressure on the inflamed surface, and most of all the stretching of the inflamed membrane, which disturbs the chronic inflammation of the part; pain, even swelling, and an increased soreness are the effects of this practice; but with this new disturbance, the peculiar irritability depending on the former morbid state is diminished. The following is a daily occurrence. N— came to me, complaining that although the violence of his gonorrhœa was subdued, and he had been comparatively well for some time, yet there remained a clear gleety discharge. I prevailed with him to let me introduce the bougie. I introduced one of the largest size, he fainted during the operation, from that indescribable nervous sensation, which will sometimes creep over a man, who has a bougie introduced for the first time. The resistance to the bougie was only such as indicated that the membrane of the urethra was fully on the stretch. There succeeded to this a copious purulent discharge, which subsiding left him free of all complaint: repeated experience establishes this fact. D (9) came with symptoms of stricture: a resistance was felt near the bulb to the introduction of the bougie, and there was extreme tenderness.

Notwithstanding the sufferings of the patient the bougie was forced in. A similar operation was performed on the 3d day after, on the 7th, and on the 12th, when the bougie passed without pain, and the urine flowed freely without heat or spasm.

During this inquiry, we find in the observations of Bruninghausen* something worthy of attention. He made his patients dilate the canal of the urethra with the urine, by stopping the orifice and forcing with the bladder: he gives several cases in proof of his remarkable success in destroying strictures by this method of distending the canal. I have no doubt but that in some instances this practice succeeded, from what I have done with the injecting syringe. A patient has used a strong injection for weeks, and returned to me no better. I have shown him how to distend the urethra, and keep it distended for a few minutes; when the consequence was apparent, after once using the syringe.

In all these examples, there is a degree of violence done to the membrane of the urethra, and neither the bougie, nor the urine, nor even the injection, has any thing medicinal in it: there is only a dilatation of the canal, and a pressure on its surface. We might be inclined to say, that the contact of the foreign body was the cause of the salutary change, if in the two last instances the contrary was not proved, viz. that, unless the membrane of the urethra be stretched, the change does not take place.

* Biblioth. German. Vol. I.

My conviction is, that Bruninghausen, like those who use the metallic bougie to destroy stricture, does not cure the firm stricture of the urethra, but only subdues the remaining inflammation, which produces and accompanies this *dilatable stricture.*

My reader may imagine, after what I have expressed, that I wish to recommend this manner of destroying the disease by violence. I have stated the facts as they bore on this point, but not the whole truth. The effect of this violent introduction of the bougie is irregular, not sufficiently within our controul, and sometimes it is ineffectual in eradicating the disposition to inflammation and stricture, and sometimes, as might be imagined, it aggravates the disease.

We have a milder and more effectual remedy in the use of caustic; and notwithstanding the hardy manner in which some men have spoken of the caustic, as being full of danger and very painful, with confidence I say, that we have a milder and more effectual remedy in the caustic than in the bougie.

In applying the *kali purum*, or alkaline caustic, to the common stricture, I had, in several cases, been agreeably surprised at the rapid amendment of my patients. For example, I found that, after a single application of the *kali purum*, one patient said that he had no kind of uneasiness remaining; another, that if he had felt previously as he did then, I should never have seen him. I found that, instead of dreading the application of

the caustic, my patients relied upon it for the removal of all unpleasant symptoms.

Further experience, however, of the effects of this alkaline caustic did not accord with my first success. I found that, wherever there was a confirmed and hard stricture, its application was little more than innocent. I found, that after frequent applications, although the urgent symptoms were kept under, yet the stricture was not destroyed; that, after repeating applications of this caustic, on introducing a soft bougie into the canal, the indentation upon it shewed the stricture to have preserved its firmness; I may even say, its sharpness. After several applications of the caustic in Mr. Whately's manner, I have found, on dissection, no trace of its operation on the stricture. See Engravings of Morbid Parts, folio.

On revolving these circumstances in my mind, and particularly considering that this caustic took off the sensibility from the part of the canal which it touched, and thereby diminished the irritability of the parts, but did not destroy the stricture, I set about a comparative trial of the effects of the two caustics, the *kali purum*, and the *argentum nitratum*.

I found that, although the alkaline caustic was particularly strong when applied to a living surface, and its influence confined to that surface, yet, when a small portion of it was inserted into the end of a bougie, it became, even during that operation, moist and soft by the absorption from the atmosphere; and that, further, when the point

of the bougie, thus loaded, was dipt in oil, or covered with soap, the caustic was rendered mild; and, by the time it was carried through the urethra to the stricture, it was little else than a liquid soap with a large proportion of alkali.

I took off a small portion of the cuticle from my arm, and applied the lunar caustic to the part during half a minute. A deep slough formed, accompanied with a kind of soreness and sensibility over the arm. A fortnight afterwards I tore up the slough, which was dried and hardened, and a small but deep hole was left. I applied the *kali purum* in the same way; that is to say, I cut off a portion of the cuticle from my arm until the surface bled. I introduced a small portion of the alkali into the end of a bougie, dipped the end of the bougie in oil, then moistened it with saliva, and applied it to my arm, taking as nearly as I could the usual time occupied in the operation on the urethra. The pain was sharp; but there was less swelling, less blush of redness round the spot where it was applied, than in the former instance. These effects soon subsided, leaving no unpleasant sensibility on the arm, as the former caustic had done; and the vascular surface was not covered with a slough: although a certain transparent whiteness was on the surface, yet the small vessels could be seen. On dropping a little diluted nitrous acid, which happened to stand by me, on the spot, there was no pain; but on touching with the acid a part of the skin to which the caustic had

not been applied, but of which the cuticle was taken off, the pain was exquisite.

These experiments, though on a very trifling scale, were yet quite sufficient to explain to me the effect of the application of the *kali purum* to stricture in the urethra. In the way in which it is applied, it becomes a weak caustic, flowing out as it is dissolved ; deadening the surface of the urethra, and subduing the inflammation, but not sufficiently powerful to bring a deep slough from the firm stricture. Now the portion of the urethra which is in a state of inflammation is very sensible to the urine passing over it ; to the touch of the point of the bougie ; or to the action of the muscular fibres which surround the urethra. But when, by the operation of this milder caustic, the sensibility of the surface is diminished, then the urine or semen is emitted without pain, and even the bougie can be introduced When the bougie is introduced into a man's urethra, he is more sensible of the degree of force than the surgeon is ; he judges of the violence by the pain. And here a surgeon who is so disposed may have an opportunity of deceiving his patient. When a bougie of a small size is resisted by a stricture, and gives pain, he may yet assure the patient, that if he will submit to the caustic, he will introduce a much larger bougie with less pain, and that immediately after the application of the caustic. The reason is that, the sensibility being diminished, the patient does not shrink from the hand ; and now the dilatation of the part of the passage suffers the instru-

ment to enter, and the patient thinks that the stricture is destroyed. This is one of many occasions which exposes the patient to deception, and makes it of importance in the cure of this disease, above all others, that the sufferer should be satisfied of the honour, and fair professional fame of the surgeon before he entrusts himself to his hands.

The plan of cure to be pursued on the principles I have stated is this. First, ascertain by means of the ball probe the place of the urethra which is inflamed and narrowed; then take one of the ball probes, with a hole drilled in it, and load it with a very small portion of caustic; pass the ball down to the obstruction, and allow it to remain until the caustic is dissolved: of course it flows out upon the inflamed surface.

The patient has no unpleasant sensation on the introduction of this instrument; a warmth not rising to pain is the only sensible effect. When the alkali is dissolved, a bougie of such a size as gently to dilate the stricture, is introduced for the space of a minute. The bougie glides easily into the stricture now; because the parts are soaped by the dissolution of the alkali, and the sensibility of the surface deadened by the operation of the caustic. The result of this treatment is a relief of the urgent symptoms. The application is repeated at the end of three days. After three or four applications of the caustic, the bougie alone is to be used, and the caustic to be had recourse to only if the diseased irritability and sensibility of the passage are

unsubdued. I hope my reader does not suppose me to have fallen into the vulgar error of imagining that there is here a specific effect produced by the use of the alkaline caustic. I have said that it diminishes the sensibility of the surface, and that the cure is accomplished by the destruction of the morbid irritability and pain which keep up the disease. This effect of late I have found to be as surely produced by the use of the lunar caustic as by that of the kali purum. It was impossible to observe the effects of the lunar caustic used for the purpose of destroying an obstinate stricture, without being convinced that the immediate good consequences resulted from its deadening the morbid surface, not from its destroying the stricture and carrying off the solid substance. By applying it in the same way in which I had used the alkaline caustic, or by inserting a very small portion of it in the end of the bougie, I found that I could allay the irritation, and in the end subdue the inflammation, which produces the dilatable stricture; indeed I have used the lunar caustic with immediate benefit when I thought the cure proceeding slowly under the use of the alkaline caustic.

OF THE SPASMODIC STRICTURE.

Allowing the part of the urethra diseased to have been originally muscular and contractile, the condensation and callosity inseparable from confirmed stricture must be attended with loss of the

contractile power. We hear perpetually of spasmodic stricture, and of spasmodic obstruction in the stricture. There remains not a doubt in my mind that this is an error; and that it is an error of great consequence, as it leads the surgeon off from the principle and sure guide in practice. I purpose, therefore, to examine this subject: for while I deem it in my own mind quite sufficient that all strictures are attended with a degree of spasm, although it is demonstrable that some of them are as firm as cartilage, and that they cannot in themselves contract or be dilated, yet I would not have my reader to rest satisfied with this argument.

The notion that the occasional obstruction to the discharge of urine, when there is stricture in the urethra, arises from spasm, is very natural. When the patient is unable to expel his urine, and feels a girding, and tension, and pain in the seat of the stricture, he attributes these indirect effects to the stricture primarily. But this belief on his part must not satisfy us. Neither, I hope, will my reader take the effect of heat and cold on the stream of urine implicitly as evidence of the varying state of the stricture; since it occurs equally in health and disease. I believe it to be a very erroneous opinion, that there is relaxation of the stricture when the bougie is allowed to remain in contact with it. There are two circumstances which have given origin to this opinion, that the stricture spontaneously relaxes. If a bougie of the common sort rest against a stricture, it is some-

times prevented from passing by its stiffness; and when it softens and becomes pliant, the point takes the due turn and passes the obstruction. Again, the first touch given to the sensible stricture, however slight, gives the most acute pain, that marrow-piercing irritation, which is so insufferable to the patient: but on continuing the gentle pressure, the patient is at last able to bear the increase of it until the point passes the stricture. This is called the relaxing of the spasm in stricture. The feeling as if the bougie were held and grasped by the stricture is the greatest when the bougie has been suffered to remain in the urethra some time; and is occasioned by the stricture making an indentation on the soft bougie, or by the bougie becoming dry at that part where it is most firmly wedged.

I shall now endeavour to explain how this idea of the spasmodic nature of a stricture has arisen; and that it has been supported on false data. By mistaking the effect of the proper muscles of the urethra, the whole lining membrane of that canal has been imagined to possess a muscular property. I have made experiments which I need not describe in this place, and which prove that the urethra, anterior to the place of the ejaculator seminis possesses no muscular power. In the course of practice, I find that, when the silver ball is introduced down to the ejaculator seminis, it is resisted by that muscle (especially when the parts are irritable). I find it sometimes thrown out of the grasp of the muscle, but when pushed

fairly into the sinus of the urethra, which is into the middle of the muscle, the ball is allowed to remain.

If we examine the structure of the canal of the urethra anatomically, we shall be irresistibly led to the conclusion that it is merely elastic ; and that where muscular action is required there are superadded muscular fibres embracing the proper canal. I have carefully examined the membrane of the urethra through its whole extent. I find it very thin and delicate ; but I see no appearance of muscular fibres transverse or longitudinal. I have examined, by dissection, the part of the urethra in the neighbourhood of stricture ; but in circumstances of long continued irritation, and where the muscular coat of the bladder was greatly increased in strength, I have not found a corresponding change on the urethra. At most, what are seen on dissection are but fibres ; and in the simplest membrane, as in the peritoneum, fibres are always to be seen on minute inspection, where nevertheless there is no muscular power.

It has been said, that when a portion of this membrane is in an inflamed state from gonorrhœa, its surface is more readily stimulated, and the urine causes it to contract so much, that the urine comes away only in drops, or a very small stream ; in this state of the parts, if the penis be immersed in warm water, the effect of the stimulating urine is less sensibly felt by the membrane of the urethra, which frequently becomes relaxed, and the water

passes more freely. Again, it is stated that after the inflammation of gonorrhœa is gone off, and stimulating injections are used, with a view to stop the discharge which continues; in many instances where the injection stimulates the parts to a great degree, it will not pass on towards the bladder, but produces so strong a contraction in the membrane, as entirely to obstruct the course of the injection, and frequently reject it altogether with considerable velocity.

The answer to this is: that five inches of the canal by measurement is surrounded by strong and proper muscles. We find the *accelerator urinæ*, or *ejaculator seminis*; the *sphincter vesicæ*; the *compressor prostatæ*; *compressor urethræ*; the *levator ani*; clinging around the canal of the urethra. It must never be forgotten, that it is the sensibility of the urethra which governs the contraction of these muscles.

In a great measure from the proofs I have already adduced, but principally from the symptoms of the disease itself, I object to the following reasoning:

It has been further said, that the urethra, like every other muscular structure, is liable to a spasmodic action which produces a degree of contraction beyond the natural; and in that state the canal loses the power of relaxing till the spasm is removed. This is what is termed a spasmodic stricture.

And further it is urged when a portion of the urethra is disposed to contract beyond its natural easy state, this disposition commonly increases till

the part becomes incapable of falling back into a state of complete relaxation, and the canal remains always narrower at that part.

In this stage it is both a permanent stricture and a spasmodic one. It is so far permanent, that it is always narrower than the rest of the canal; and so far spasmodic, that it is liable to contract occasionally in a still greater degree.

I hope my reader sees that this is but hypothesis, and an opinion unestablished in proof. For my own part, I confess my wonder that men in a profession like ours, whose business leads them to observe and reason continually, should first take it for granted, that there were circular muscular fibres in the membrane of the urethra; then that one of these fibres could obstinately and permanently contract. Nay further, as a stricture is often on one part of the circle of the canal only, that the third part of this circular fibre contracts thus to form a stricture; we find them believing that this single fibre, or third part of a fibre, could take a "wrong action," and become occasionally contracted so as to be a spasmodic stricture; then permanently contracted to a certain degree; and at the same time capable of a further occasional contraction, so as to become both a permanent stricture and a spasmodic one.

I am confident that the profession will come to as full a conviction that the sole origin of all strictures in the urethra is inflammation, as that adhesions of the pleura are caused by inflammation. For the most part the cause of stricture is

gonorrhœa ; but this specific kind of inflammation is not always the occasion of it : it has its source in whatever produces continued irritation to the parts. Most commonly, however, the course of the disease is this : the gonorrhœa has gone on unchecked until the inflammation being at its height, there is purulent secretion and chordee ; the disease which was originally seated near the orifice of the canal has been propagated backwards. The real inconvenience now, the pain and alarm, make it necessary to use proper remedies, and for the time secure continence and care on the part of the patient. The symptoms are ameliorated, but the irritation does not entirely subside. The inflammation is only more partial. Still the patient has pain and heat in urine, and there still from time to time flows a gleety discharge. This gleet, it appears, is not, as often supposed, the effect of mere relaxation of the vessels after inflammation, allowing too profuse a discharge ; but the vestiges of inflammation in a milder and more chronic form. If this state of the parts be permitted to continue, a firm stricture will in the end be formed. The degree and firmness of the contraction will be found to hold a strict relation to the length of time, and the frequency of the occasional increase of the irritation, pain and discharge. The effect of the inflammation in producing stricture varies somewhat, as I have taken an opportunity of already explaining.

I have now to state how it happens that there is spasm and difficult flow of urine attending all the

stages of stricture; from the first inflammation, till the disease is confirmed, and the contraction becomes firm as cartilage.

In the voluntary motions of our limbs there are two distinct states of muscular action necessary to the movement. If the finger or hand is extended, or closed, it is not by the mere contraction of one muscle forcibly elongating its antagonist, nor does the relaxation of the one follow the contraction of the other; but if the action be to bend the finger, the same influence which is exerted to excite the flexor to contraction is also exerted to relax the extensor. I need not bring this to demonstration here.

I shall only state that there is a concatenated state of the two classes of muscles in every natural action; that, however strange it may appear, there is no perfect relaxation but in consequence of motion. It is only when there is a contraction of one set of muscles that there is a perfect and entire relaxation of the other. As this state of relaxation of one muscle is as necessary to the motion as the forcible contraction of the other, I may call this influence exerted on the yielding class of muscles a negative activity.

Of the voluntary muscles there are two classes; and by the direct influence of the will we call one set into activity, and the other indirectly into a state of relaxation or negative activity.

There are some classes of muscles over which we have no direct power of the will to make them relax, or certainly not without calling for the activity of their antagonist: For example, the muscles

betwixt the sternum and larynx are in permanent action when the throat is at rest; and the change which we observe them subject to, is from action to relaxation. But to produce this relaxation we have to bring into contraction their opponents, viz. those which arise from the jaw, and are inserted into the larynx, and which in the act of swallowing draw up the throat while the lower muscles relax and are stretched. All the sphincter muscles are of this class: their more permanent state is firm contraction, and their powers are not exhaustible like those of the muscles of voluntary motion. By their contraction they retain the contents of the hollow viscera. These hollow viscera are surrounded with a muscular coat, which is of course the opponent of the respective sphincter muscles. And now it will be readily understood that the sphincter does not yield up its office, or relax, unless there be a corresponding contraction in the muscles of the hollow viscus. Thus the sphincter to the lower orifice of the stomach will not cease to reject the matter offered to be transmitted to the intestines, unless the stomach contract naturally; and the natural contraction of the stomach must be preceded by the full and natural digestion of the food. Often, therefore, the food, being of an indigestible kind, is retained loading the stomach. In the rectum, the effort to evacuate, viz. the contraction of the gut, is attended necessarily with the perfect relaxation of the sphincter ani. So it happens in the womb during delivery; the orifice and fundus of the womb have antago-

nist fibres, and the contraction of the body and fundus of that viscus is attended with relaxation and distention of the orifice.

The bladder is surrounded with its muscular coat, the *detrusor urinæ;* the neck of the bladder is surrounded with the *sphincter;* the prostate gland embraced with the *compressor prostatæ;* the membranous part of the urethra, besides having circular fibres, is pressed by the *compressor urethræ* and *levator ani;* and the sinus, and a considerable part of the urethra, is surrounded by the *ejaculator seminis.* These muscles are all opponents to the muscular coat of the bladder, and are in sympathy with it. Not that sympathy which combines in simultaneous action, but that connection which exists betwixt flexor and extensor muscles, and which provides that the action of the one shall be attended with the relaxation of the other.

The paralysis of the urethra has been treated as a disease: the incontinence of urine is considered as an effect of the diseased inactivity of the muscles of the urethra. The disease is rather in the over action and irritability of the coat of the bladder: the smallest quantity of urine falling down into the bladder produces an action there, and consequent relaxation of the sphincter; and the water dribbles insensibly away. The disease is of the same nature with that which produces the relaxed anus and pendulous gut of a child whose rectum is irritated by ascarides. Blisters, tincture of cantharides, spices, and steel medicines, are improperly given on the idea of exciting the re-

laxed sphincters; whereas the attention should be directed to ascertain the cause of the contraction of the bladder. Whenever we are perfectly aware that the contraction of the bladder and the relaxation of the urethra, or the contraction of the urethra and quiescence of the bladder, form one combined action, we comprehend how a blister to the sacrum or pubes will sometimes produce stranguary, sometimes incontinence of urine; for it produces an immoderate irritation on the parts which stand united in function, disordering their natural relations.

When the bladder is distended with urine, and the muscular coat has no disposition to contract, the introduction of the bougie into the urethra will cause the urine to flow. The reason is, that the muscles of the urethra being distended with the instrument, this state of forcible distention calls the muscular coat of the bladder into action,—without which no distention of the urethra would procure evacuation. We may observe that, when a bougie is introduced into the urethra a few inches only, there is no consent with the bladder; but when the point of the bougie reaches the sphincter muscles, and even when it distends only the fore part of the ejaculator seminis, the desire of passing urine is very great.

Spasm of the urethra is supposed to be directly the reverse of paralysis in the urethra. But in spasm of the urethra also, the bladder and the muscles surrounding the urethra are still engaged together, and are mutually disordered as antagonist muscles.

If we look into authors, we shall find that the urine is said to be obstructed from many causes; from debauch, inducing spasm in the neck of the bladder; from fulness in the vessels of the neck of the bladder; from stricture; from piles; from injury to the perinæum, or disease of the prostate gland. In all these instances, the obstruction to the flow of urine is in a great measure owing to the diseased action of the muscles; in some of them it is entirely to be attributed to this cause.

I shall state the simplest and least equivocal case. A young man, through false modesty, being in the company of ladies, resists the urgent call to make urine; at last he escapes, and thinks to evacuate the whole contents of the bladder, but cannot pass a drop of urine.

A woman in labour has the neck of the bladder pressed by the head of the child, so that the bladder suffers great distention. After the delivery the urine does not flow: it accumulates; and I have seen it distend the belly to a degree as great as before labour.

In these cases the distention of the bladder has too far stretched the muscular coat; and by this distention the muscular fibres have suffered a kind of paralysis, and are incapable of contraction. But this is not all; the antagonist sphincter muscles will not relax, or but very irregularly: there is a spasm and girding of the muscles of the urethra; and pressure on the belly will not empty the bladder: the catheter must be introduced. Now this pure case, if I may use the expression, is sufficient

to shew us, that, however obstruction of urine may commence, in the end the muscular apparatus is engaged, and becomes a cause of increased difficulty of passing the urine. This is especially the case in stricture of the urethra; and while the stricture is stationary, neither contracting nor relaxing, it has the effect of disordering the natural sympathy of the muscles, and of inducing contraction of the sphincter fibres and obstructing the urine.

But there is another and a more frequent cause of spasm in the urethra and neck of the bladder.

In the diseases of the urethra, as in other parts of the body, inflammation precedes or accompanies increased sensibility. Where stricture is, there is much increased sensibility; and wherever the stricture is exquisitely sensible, there we are sure to find the function of the muscles deranged, forming the case which is called spasmodic stricture. This spasm is produced by the acrid urine coming in contact with the sensible surface of the urethra, which being inflamed is not imbued with its sheathing secretion: instantly the muscles are called into action; the ejaculator seminis contracts by impulse, as is its nature when excited; and the other sphincter fibres contract firmly; so there is frequent call, and frequent stoppage, of the urine, with painful contractions of the fibres on the inflamed and excited parts. This action of the muscles of the urethra does not merely obstruct mechanically the flow of urine, but by the sympathy existing betwixt these muscles and the *detrusor*

urinæ, or muscular coat of the bladder, the contraction of the bladder ceases.

Thus out of a party of men drinking together, there will often be one who before evening cannot pass a drop of urine. On enquiry, you will find that he has had slight disorder in the urethra, perhaps the remains of gonorrhœa. It is a mistake to suppose, in such a case, that the fulness of the vessels has closed the passage to the urine ; the same cause which has inflamed his countenance adds to the inflammation and sensibility of the urethra, and the first drop of acrid urine is followed by contraction and spasm, and obstruction.

The apparent changes in the stricture of the urethra are attributable to the disorder of the neighbouring muscles, muscles which surround the stricture, if it be seated within five inches of the bladder.

There seems to be no stricture without more or less accompaniment of inflammation. This is the reason why strictures are so seldom stationary ; for, being originally produced by inflammation, the continuance of inflammation, even in a slight degree, increases the stricture. This also explains why a stricture becomes progressively worse, and why it returns after the apparent cure of it.

Of the existence of inflammation in stricture we are informed by the introduction of the bougie ; for the stricture, or the part in the immediate neighbourhood of it, is exquisitely sensible. I need not enter here into the proof that no sensibility exists without increased vascular action. When I pass the ball probe down to the stricture,

there is great pain: but, when the ball has passed the stricture, the pain ceases. In bringing the ball back again towards the stricture, the pain is felt as on the first intrusion of it, when it approached the fore part of the stricture. This pain on the back part of the stricture proves that the inflammation attending the disease is in equal degree behind as on the fore part of it. But there is a proof of its being *greater* on the back part than on the anterior part of the stricture; a fact in which we cannot be deceived, since it is brought to demonstration on the dissection of the parts. I have seen, on dissection, inflammation and coagulable lymph behind the stricture, when there was none betwixt the stricture and mouth of the urethra; and when the urethra has been inflamed in all its length, I have found it always most inflamed behind the stricture. When ulceration takes place in a case of stricture, it is behind the stricture, not on the part of the urethra anterior to the stricture. We cannot have a better proof of previous irritation and inflammation than in the formation of an ulcer. Indeed we might *a priori* conclude that, where the difficulty is felt, and the push of urine is made, there would the principal irritation be. The inflammation which, in a lesser degree, produces ulceration behind the stricture, and fistula in perinæo, will sometimes, by a more rapid course, be propagated backwards; and the distention of the bladder, ureters, and kidneys, and their ineffectual struggles to unload themselves, having

prepared them for partaking in the same inflammation, the patient is cut off. To understand the symptoms of inflammation, when propagated towards the bladder, ureters, and kidney, ought to be the first object of every one who attempts the cure of diseases of the urethra, and especially by the application of the caustic. He ought to know how caustic will sometimes act like a charm in relieving the complaints concomitant with stricture; how it will, on the contrary, sometimes bring forward the fistula in perinæo, sometimes hasten the death of the patient. I thank God that I have no cases of the latter description to relate from my own practice; but the books on the subject of stricture leave practitioners open to this terrible misfortune, for want (as I take it) of sufficient discrimination in the cases brought forward.

To understand the effect of caustic in subduing irritation in the urethra, in cases of stricture, we may take the following conclusive example. If a man has an ulcer in the pellucid cornea of the eye, the ulcer keeps up a great deal of inflammation and irritation in the whole eye; but if we apply caustic to the bottom and tender part of this ulcer, the irritation and inflammation of the eye quickly subsides. When we examine the circumstances of this case, we find that the ulcer is highly irritable, and that the acrid tears flowing into it are a principal cause of the continuance of the disorder. The touch of the caustic deadens the surface; then the tears are no longer a cause of irritation,

and the general inflammation and pain therefore subside. The effect of the caustic applied to the eye in this manner is however only temporary; the surface touched by the caustic is thrown off, and exposes a sensible granulating surface, the tears now having access to this new surface, the pain and irritation return in a certain degree: a second touch of the caustic again destroys the sensible surface, and, before it be again exposed, the hollow of the ulcer is nearly filled up, and a healthy or a more natural state of the part is substituted for the eating sore. Several such gentle applications of the caustic do not prevent the ulcer from filling, and a cicatrix at length forming.

The application of the caustic to the urethra has an effect very similar to this. The stricture is exquisitely sensible, and, when the urine comes in contact with it, there is such an excitement as is necessarily attended with spasm. The first effect of the caustic is to destroy the sensibility, and then the urine passes without exciting spasm. In explanation of the circumstance that the caustic has not always this effect of subduing spasm and irritability, let me observe to you, what is too little attended to, but which I have no doubt you will at once allow to be just; that, if only the fore part of the stricture is touched by the caustic, the principal source of irritation remaining behind the stricture, the patient will find no relief. But when the excitement and vascular action from the caustic commences, this, in union with the perma-

nent source of irritation behind the stricture, increases to the effect of raising a formidable inflammation with spasm and obstruction.

THE OPERATION OF PUNCTURING THE BLADDER.

When the urine is obstructed, the symptoms alarming, and the danger of the patient imminent, he may be saved by puncturing the bladder. This operation is to be considered as the last resource. But the last effort of art is often delayed till the patient is lost; and, therefore, an anxious question is for ever recurring, how long are we to wait, or when is the necessity of this operation declared?

When the bladder is distended it is easy to determine on the right time for performing the operation. When the bladder has risen above the pubes, and is felt tense and full, occupying the lower part of the abdomen; when bleeding-laxatives, the tepid bath, the catheter, the bougie, have been tried without procuring relief; when there is no other resource, nor any hope of a spontaneous discharge of urine, the operation ought not to be delayed. If there be retching and hiccup, there is no time to be lost; the patient is in imminent danger.

But there are cases in which this operation ought to be performed, and where the bladder is not distended; where the irritation upon the blad-

der has either thickened its coat or prevents the accumulation. Thus a man, with stricture in the urethra, attended with great irritability and frequent straining to pass urine, will have these symptoms aggravated by the use of caustic, or the ineffectual attempts to pass the bougie, and he comes into a state of as great danger, from the effects of this difficulty in passing the urine, as he would from the consequence of accumulation in the other case. The bladder has been punctured, and although only four ounces of urine have been evacuated, yet the relief has been as remarkable as when pounds of urine have been discharged.*

The following are the more common indications of danger: the inclination to make urine has subsided; there is less pain; at intervals, during four days, perhaps, he has passed only a pint of water; the belly is hard as a ball; the bladder is felt rising above the navel; the pulse 100; the mouth and lips parched, and the breathing quick. If there follows this an oppression of the faculties, hiccup, or a low delirium, we may be too late, although the bladder has not given way.

In the cases of distended bladder from obstruction to the urine, the 6th or 7th day of the obstruction (allowing a pint of water forced away by the urethra dripping and wetting the cloths) is that in which the urine generally escapes into the belly, after which all is lost. But, in saying this, I am,

* See a paper on this subject by Sir Everard Home, in the Transactions for the Improvement of Surgical Knowledge.

perhaps putting too much weight upon an impressive instance in my recollection. When the urine escapes, the patient is sensible of something giving way. And, during the flowing of the water from the bladder into the cavity of the peritoneum, there is extreme pain and anguish. And now, instead of the hard and regular tumour of the bladder, the belly has become softer, and more generally swelled. The pain has much subsided ; but in its place there is more anguish and inexpressible uneasiness ; perhaps delirium or phrenzy.*

We have to decide upon the place and manner of operating, and this must be determined by the nature of the obstruction.

If the occasion of our performing this operation arise from a kick in the perineum, or an injury from falling upon the perineum, or an obstinate narrow stricture aggravated by caustic, we have little to determine, further than whether the swelling, which, upon introducing the finger into the rectum, we feel, pressing down the upper part of the gut, be the distended bladder, and contain urine : of this we must be well assured. We press it, and we feel that it contains fluid, and may feel the undulation communicated from a smart tap upon the belly.

* The phrenzy into which a patient rises in the last stage of disease of the urethra and bladder, I have known to be mistaken for madness, and a family made more miserable by a physician of a lunatic hospital being called in to consultation.

But if the obstruction be owing to an enlargement of the prostate gland, the surgeon would do well to satisfy himself whether the tumour which he discovers above his finger, be not the prostate gland, instead of the lower bulging part of the bladder. This, if he possesses any tact, he will be easily able to do by attending to the solid resistance of the tumour of the prostate: when, by stretching the finger over it, and pushing it deeper into the rectum, the more elastic bladder will be found beyond it.

If the tumour of the prostate gland be not very large, there is no difficulty in puncturing the bladder through the coats of the rectum. But the disease of the prostate is not the kind of obstruction which requires this operation to be

performed ; yet it may be my limited experience, which enables me to say, that I have always found it practical to introduce the catheter in enlargement of the prostate gland.

THE OPERATION.

Having oiled the fore and mid fingers of the left hand, they are introduced into the rectum, and bending then upward, the bladder is felt.

Then having the long trocar, proper for this operation, in the right hand, (the sharp point of the stilette being drawn within the end of the canula) it is introduced betwixt the fingers, which are in the rectum. The sharp stilette is now pushed out from the canula, and the point of the stilette takes the place of the point of the fore finger, which is pressed upon the bladder. It is then pushed into the bladder in the direction of the axis of the pelvis, the handle of the instrument being at the same time carried backward, that is, towards the os coccygis. The stilette being withdrawn, and the urine discharged, the canula is to be carefully retained by a proper bandage, until the wound may be supposed to have inflamed, and the cellular membrane betwixt the rectum and bladder consolidated. If, after the second day, the canula should be forced out, the urine will continue to be discharged through the rectum, unless, in the mean-time, the obstruction in the urethra be destroyed. The chief inconvenience of retaining the canula in its place,

is from the injury its extremity does to the coats of the bladder. On dissection, I have seen the surface of the bladder opposed to the extremity of the instrument inflamed. I conceive, therefore, that this must keep up the distress of an irritable bladder. To avoid this, in a certain degree, a soft bougie should be introduced, so that it project a little from the end of the canula, and defend the inner coat of the bladder.

It may be advisable, after this operation, to continue the operation of caustic, on that disease of the urethra which produced the necessity of puncturing the bladder.

OF THE OPERATION ABOVE THE PUBES.

The bladder may be punctured above the pubes; because when it is greatly distended and has risen into the abdomen, it carries the peritoneum with it, so that the reflection of that membrane from the os pubis to the fore part of the bladder is shifted upwards, and a space is left betwixt the bone and the reflected membrane, where the trochar may pierce into the bladder without entering the sac of the peritoneum. Unless where the bladder is distended very much, it would be very improper to perform the operation here. The patient is to be placed reclining backwards, having pillows under his loins, both to throw forward the belly and to keep him from shrinking; a lancet is used to pierce the skin; the

trochar is then to be passed directly over the os pubis. The stilette of the trochar being withdrawn, the urine flows at first with force. But before the urine be entirely evacuated, I think it advisable to introduce a flexible gum catheter through the canula. This will prevent all possibility of the bladder slipping off the instrument, which, in operating on a gross fat man, or with a short instrument, is possible. When the urine is evacuated, the canula may be withdrawn over the catheter, and the latter left; but I recommend that the canula as well as the flexible catheter be preserved in its place until the parts have consolidated by inflammation; for the fulness of the distention of the wound by the canula will prevent that infiltration of urine among the cellular membranes, which is otherwise apt to happen. Thus, in Mr. Hunter's operation, only the flexible catheter being left in the wound, "the urine came principally and freely by the side of the instrument." *

The consequence most to be apprehended in this operation is the escape of the urine into the cellular membrane under the peritoneum, and the difficulty, I may say the impossibility, of the urine escaping by the wound, if it gets into that situation, makes me decidedly prefer the operation by the rectum.

If the urine escapes from the bladder without passing the lips of the wound, a swelling with inflammation appears on the lower part of the belly,

* Sir Everard Home's paper, l. c.

and the cellular membrane is seen dead and sloughy in the wound. It will be happy for the patient if by this time the passage of the urethra has been made good, and a flexible catheter introduced; for now it would be necessary to give vent to the matter of this abscess, and withdraw the instrument from above the pubes.

From both these operations peritoneal inflammation is to be dreaded, and the symptoms of its approach, viz. pain in the abdomen, soreness when pressed, heat, thirst, and restlessness, will be anxiously looked for and dreaded; to remove which we bleed by cupping or leeches, foment the belly, administer mild purgatives with diaphoretics and anodyne clysters, or with those we use the warm bath, and apply large blisters on the abdomen. In all cases of irritation upon the urinary passages demulcent mucilaginous fluids ought to be taken freely.

OPERATION IN THE CASE OF THE URINE BURSTING INTO THE PERINEUM AND SCROTUM.

The distention of the scrotum with urine in consequence of stricture is so common an occurrence, of such dangerous consequences, and requiring aid so immediately, that I have placed it here in a distinct chapter.

Whilst these papers are before me there has been brought into the dissecting room the body of a man who had died of mortification from the burst-

ing of the urine into the scrotum. I still continue to give occasional lessons in the dissecting room, when the pupils request my advice on practical subjects. This was an opportunity not to be neglected. The subject drew these remarks from me : " I see you struck with this appearance ; the penis thus enormously distended ; the scrotum of this unusual size ; the blackness of the integuments : let me lead you to contemplate this not with an ignorant wonder, but with the highest interest. This is the fate of a patient ignorantly and timidly treated ; undoubtedly I may say timidly treated, for although the diseases of the urethra and bladder do for the most part require a cautious and gentle interference, here is a case which requires a ready judgment and very decisive measures. This is not a common mortification, but is the consequence of the acrid and stimulating urine driven into the loose cellular texture of the perineum, scrotum, and penis. When I cut into this mass, you see the urine filling the texture of the integuments, and that the body of the penis properly and of the testicles lie hid in the distended cellular membrane. I pledge my judgment that in dissecting the parts, we shall find a stricture of the urethra that has been improperly interfered with, so that total obstruction has been occasioned ; we shall find a rupture of the urethra behind the stricture ; and we shall find the muscular coat of the bladder greatly increased in thickness. The increase of muscular power in the

bladder, a consequence of stricture, I conceive necessary to this forcible distention of the cellular membrane with urine."*

"You would do well to study the symptoms which indicate the bursting out of the urine, so that you may be prepared to prevent this catastrophe. But if you should witness the rupture of the urethra, contemplate the consequences here, and be prepared to understand that it is not puncturing with the lancet that will free the parts from their load of urine.

"This will be the course of symptoms: the patient has stricture attended with irritation, and the urine is passed with straining. There is a feeling as of a tumour betwixt the thighs; pain on pressing there, and throbbing in the part; there is a sharp pain or scalding when the urine is passed; there is shivering and fever. At last the patient, straining very much, feels something give way; has the sensation of the urine flowing, but no urine appears at the extremity of the urethra; in the mean-time the scrotum, penis, and skin of the pubis are suffering distention.

"The constitution immediately sympathises with this violent derangement: the cellular membrane possesses a low degree of life; the acrid urine is too violent a stimulus; the parts are disposed to slough; the constitutional strength

* The cast of this subject and the dissected bladder completes the series of preparations of fistula in perinæo, to be seen in my Collection.

suffers; there is sickness and shivering; the patient falls low and irritable; his pulse becomes quick and small. If relief is not obtained, thirst, restlessness, and delirium increase, and the parts blacken, and he dies."

"He dies, if he is old and debilitated; if the constitutional powers have been exhausted by long suffering. Instead of such an appearance, as this before us, I have seen the whole integuments slough off, and leave the testicles hanging bare."

OPERATION.

1. PLACE the patient with the breech on the edge of the bed or table, two assistants holding the thighs asunder. 2. Introduce a sound down to the stricture in the urethra. 3. Take a sharp-pointed scalpel, and strike it like a dagger into the distended integuments, until its point meets the point of the sound; then, carrying the hand downwards, enlarge the wound of the integuments, while you keep the point of the knife steady. 4. One touch more of the point of the knife will cut through the stricture of the urethra, and lay open the bursten part of the canal.

A natural desire now rises in the surgeon's mind to complete the operation; but I protest against a teazing interference with the parts in their present condition.

We now bathe the parts with an emolient fomentation, and, dressing simply or with a poultice,

our attention is directed to support the patient's strength.

OPERATION FOR FISTULA IN PERINEO.

This is altogether a very important subject. It would be vain to describe the operation without attending to the principle, which is to direct the surgeon; and to arrive at this, I shall detail the progress of the case as it commonly happens.

Behind a stricture is the most sensible part of the urethra, and there the push of urine being made, the distention of the canal is greatest, and, consequently, the urethra is most likely to give way at that place. I have brought this to demonstration*; for on injecting wax into the diseased urethra, I have invariably found that it burst out behind the stricture. We can therefore readily understand how it happens in the case mentioned above, that by violent straining where there is a considerable increase of the strength of the bladder, the urine suddenly escapes.

Generally, however, the ulceration of the urethra proceeds more gradually, and the parts inflaming there is not this extensive infiltration of the cellular membrane; but an abscess is formed, which, pointing in the perineum, is discharged, so that afterwards the urine flows partly through this fistulous opening, and partly by the urethra.

* See Engravings from Specimens of Morbid Parts in my Collection

Successive inflammations arise, the urine passes with more difficulty, and new abscesses are formed. The whole integuments of the perineum and scrotum are inflamed, swelled, and full of irregular hardness.

In most cases, to remove the cause by destroying the stricture, cures the disease ; for it is the difficulty of passing the urine by the urethra which necessarily directs it into the irregular sinuses, by the side of the natural passage ; and it is this which keeps up the irritation and the disease. If the stricture is entirely removed, and there is no great destruction of the canal, the inflammation and hardness soon subside, and the ulcers close. But when the fistulous opening is of long standing, and the urethra is callous, and closed almost entirely for a considerable extent, then the urine is driven amongst the cellular membrane of the perineum, and tubes of condensed cellular membrane are formed ; these are sometimes not confined to the perineum, but extend forward into the scrotum, or even backward to the neck of the bladder, or the extremity of the gut. This state of the parts requires a different operation.

OPERATION.

Instruments.—A variety of silver catheters and probes, flexible catheters and bougies, a syringe, sponge, lint, &c. and the common pocket case, will be required for this operation.

The patient is placed in the position as for lithotomy. A straight catheter or sound, A, is introduced into the urethra, down to the obstruction, B. Then a probe, C, is introduced into the fistulous opening in the perineum. Often the straight probe will not follow the obliquities of the canal; it must be bent, and made if possible to hit upon the extremity of the catheter or sound. It cannot be made to touch the catheter, that is to say, the soft parts must intervene, because the catheter is within the urethra, and above the stricture.

The diseased integuments of the perineum are now to be laid open down to the tract of the urethra. If there is one sinus leading towards the stricture, it is to be followed; but if there are several, and they run deep backward, it is impossible to follow them towards the neck of the bladder, and improper to attempt it. In this part of the operation, a decided incision, and a fair wound, is to be wished for. A diffident groping and cutting, without any precise view, keeping the patient for an hour on the table, may be (and I know has been) followed with inflammation, which, in this exhausted and irritable state of the patient has proved fatal.*

In severe operations of this kind, there will often follow, in consequence of the continued pain and irritation during the operation, sickness and vomiting, and pain of the belly, and swelling of the testicle.

The most difficult part of the operation is to find the urethra behind the stricture. The bulb and spongy body of the urethra in the disordered state of the parts cannot be easily distinguished. The parts are massed together by inflammation, and new divisions are formed by fistulous tubes and sinuses. The urethra is not like an artery, gaping and open when cut. On the contrary, I have seen the operator cut it in all directions, both in this and in other operations, without being able to discover its cavity.

* Many of the cases which we hear of in general, where a man dies after the operation for a fistula, are cases where the parts are in a gangrenous state, as I have described in the first instance, and no blame should attach to the surgeon.

If we should fail in attempting to introduce the probe into the fistulous communication, we must cut upon the stricture and the point of the staff; we must then search with the probe for the continuation of the canal towards the bladder, and having found it, we introduce the catheter from the point of the penis, past the stricture, and down into the bladder.

The relief from the free discharge of urine by the catheter is immediate. The wound is to be kept open until it granulates from the bottom. The parts consolidate and heal over the catheter.

In a few days, when the granulations shall have covered the catheter, and the tract in which it lays is consolidated, the catheter may be withdrawn, and a common bougie introduced. The urine will not make its way into the perineum again, as long as the urethra is free.

OF CUTTING OUT PART OF THE URETHRA.

But I have now to describe a still bolder and more decided operation. It often happens that in these diseases of the perineum, the urine obtaining a free discharge by the fistulous opening, the original stricture is more and more contracted, and a considerable part of the canal is totally obliterated. This contraction and increase of the length of the stricture is no doubt accelerated by the successive extension of the inflammation in the perineum; and very often in this complicated state of the disease there is a large quaggy swelling of the

integuments of the perineum, great part of which some recommend should be taken away by a double incision in the first part of the operation. But I think one longitudinal incision in the length of the diseased integuments of the perineum will be sufficient.

Now the parts are to be pretty freely dissected, while we endeavor to make distinct the bulb of the urethra. The fistulous opening into the urethra is next to be sought for; and a staff, or sound, or catheter, having been introduced into the urethra, down to the upper part of the stricture, the tract of the diseased urethra, and the point of the staff, are to be exposed; and if the urethra proves entirely diseased for some length, it is to be cut out.

A bougie of the largest size is to be introduced from the wound, into the bladder, and another from the extremity of the urethra down to the wound. The parts are to be slightly dressed, and the patient put to bed.

After a few days, when suppuration has taken place, and the granulations are sprouting up about the bougie, it is to be withdrawn, and the catheter introduced along the whole length of the urethra; over which the parts will soon heal, if it be kept steady, and in a right situation.

After the first dressing, when we find that the inflammation is not likely to run to any dangerous degree, we must dress with a stimulating ointment on slips of lint, and over this put a warm poultice, which will promote healthy granulations.

If the case be neglected, and the catheter allowed to hang, bearing down the penis, it will stretch the parts, so that the lips of the wound will contract behind the catheter, and the part becoming callous, the catheter will be left bare, and a cicatrix be formed behind it.

TREATMENT OF THE SUPPURATION OF COWPER'S GLAND.

While I have been pressing on my reader's attention, the necessity of looking to the obstruction in the urethra as the cause of fistula, and the necessity of removing it before we can expect the sinuses in the perineum to close, or the tumefaction and irregularity of the perineum to subside, there is a case which requires to be further explained. A patient having been some time teazed with a gonorrhœa, which from his avocations he has not been able to attend to, feels at length, perhaps after a journey, that the seat of the complaint is transferred more backwards with a sense of fulness in the perineum, and a scalding sensation in passing urine. The catheter in the mean time can be passed with little difficulty into the bladder. This inflammation not being arrested by bleeding, leeching, and the warm bath, mucilaginous drink, and mild laxatives, there is at length felt in the perineum a hard waxy kind of swelling by the side of the urethra; it increases, the integuments become red, this tumour suppurates; pus is discharged; and on the second or third day the

surgeon is sensible of the urinous smell, and the dressings are wet.

This kind of fistula I attribute to the suppuration of the Cowper's gland. I may say this is an imperfect kind of fistula, yet if neglected, the urethra and the cellular membrane of the perineum will become more extensively inflamed and hardened.

If the case is taken in the beginning, there is no occasion for an operation. The irritation is kept up by the scalding urine passing over the ulcerated and inflamed part of the urethra.

My practice in this case has been to introduce a moderate sized gum catheter; which, by drawing off the urine without permitting it to enter and lodge in the ulcer of the urethra, the cause is removed, and the inflammation and discharge subside.

When the catheter is kept in the passage I have found that after some days the urine has passed by the side of the instrument: in consequence of this, the stinging and heat are again felt in the sore place of the urethra; but to remove this, it is only necessary to put a large catheter into the bladder.

OF FORMING A NEW URETHRA, WHEN PART OF THE CANAL HAS BEEN DESTROYED BY ULCER.

A WASTING ulcer, during a mercurial course, will sometimes run down from the corona glandis, under the prepuce, and eating into the substance of the penis, not only lay open the urethra, but

altogether carry it away. A gentleman presented himself to me in this situation, having uniformly met with discouragement from several eminent surgeons, to whom he had applied, they told him it was common but irremediable. He had two strictures at the same time, and the urine flowed from the side of the penis.

I engaged myself in the first place, in destroying the strictures, so that the canal might bear a silver canula lying in it. I then dilated the part of the canal towards the extremity of the penis, to see whether the urine would by this means leave the opening in the side, and take its proper channel; but indeed this I could not expect, as the canal was actually deficient about an inch and a half. I was reduced to the necessity of performing the following operation:

I had a silver tube made, six inches in length, and adapted to it a rod of soft metal, which projected through it with a probe point. I had also a very sharp stilette fitted to it. I had likewise a directory of somewhat peculiar figure, to pass into the opening of the urethra in the lower part of the penis.

In the operation I introduced my canula and its probe-pointed stilette down to near the place of opening in the urethra. I then introduced the directory into the opening from which the urine was wont to flow, and pointed it downwards to the perineum, the groove of the instrument being towards the body of the penis. I now gave this directory to my assistant, and withdrawing the probe

which was in the canula, I introduced my sharp stilette, and pushed the point through the canula: now, taking this stilette and canula firmly in my hand, I directed the sharp point obliquely from the proper course of the canal into the body of the penis, and then carried my instrument behind the tract of the urethra, until I got below the place where the urethra was deficient; then taking the directory in my left hand, I made the sharp point of the stilette grate into the groove of the directory, and of course into the proper course of the urethra; then, holding the canula and directory very firmly, the sharp instrument was withdrawn from the canula, when the probe was again introduced, and being pushed along the groove of the directory, the canula was fairly lodged in the lower part of the urethra.

Through this canula the urine passed freely, not a drop escaping by the former breach in the urethra; and during the operation not a drop of blood passed; my assistant expected some basons full. I considered three weeks necessary to consolidate the new passage into a firm canal. The only difficulty was in retaining the tube in its place, and keeping the extremity which was in the urethra from inflaming the canal. This I found could best be accomplished by introducing a flexible metallic bougie, which, passing beyond the sharp edge of the tube, kept the urethra from pressing upon it, and prevented the penis from bending at that part. A T bandage being brought round the perineum, and split, received the end of the

bougie, and pressed in the silver tube, so that it could not escape by accident, or by the impulse of the urine.

By wearing this tube for some time, and afterwards by the use of the common bougie introduced into the new passage, I made a complete canal. But one circumstance has failed in accomplishing a perfect cure. The gentleman can turn to the wall like his neighbours. The semen too, I believe, appears at the extremity of the urethra; but still there remains a lateral passage. The reason is this—the new canal joins the proper urethra a little below the opening of the urethra upon the surface. This part has been pressed quite flat by the canula, and much contracted; but by no means have I been able to destroy the natural tendency of this part to secrete. I have failed in attempting to make it suppurate and unite. This gentleman was lost at sea.

OF THE FEMALE CATHETER.

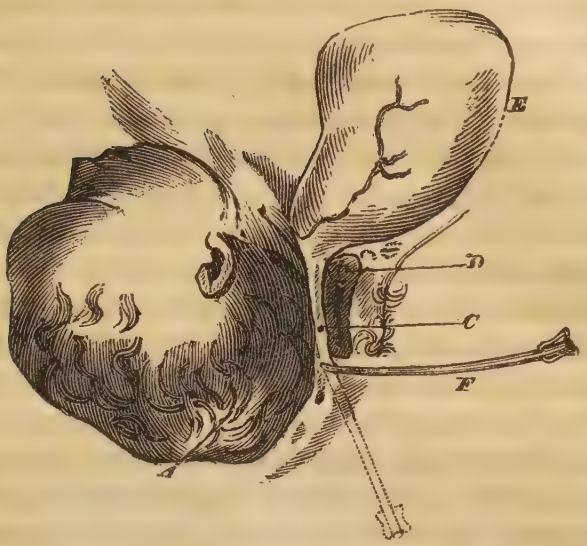
The use of the female catheter requires more delicacy, though less knowledge than is called for by obstructions in the male. The patient lies in bed, with the thighs raised, so that the feet rest on the soles as in standing. The surgeon has a basin placed before the woman, or what is better, a bladder is tied to the mouth of the catheter, that it may receive the urine. The surgeon holds the

catheter nearly as he would do his writing pen, only that the point of the middle finger is beyond the end of the catheter.

The clitoris is the guide to the surgeon. Separating the labiæ, he feels the prominence of the clitoris. He then moves his finger directly down from it; and on the margin of the vagina (or, in women who have borne children, within the vagina) he is sensible of a little eminence, or firm ring, at the entrance of the urethra. He has now only to move the extremity of the catheter off the end of the finger into the urethra.

By directing the catheter horizontally, it will enter the bladder, if the obstruction has only been a want of consent in the muscular fibres of the bladder. But if there is a mechanical obstruction, as from a tumour of the ovarium; or the womb, in the early months of pregnancy; or the child's head during labour; we have to recollect that the catheter must be carried in a direction upwards, so as to pass along the back of the os pubis. This direction of the point of the catheter is given by depressing the hand towards the perineum.*

* See the anatomy of the parts, in the last volume of the Anatomy by John and Charles Bell.



I have introduced this sketch here, as more suitable, than in my account of the anatomy of the parts. This figure represents the effect of the child's head descending in the second stage of labour, so as to compress the urethra, A, the head sunk into the pelvis, C, the urethra compressed betwixt the os pubis and head, D, the os pubis, E, the bladder of urine, which from the cause demonstrated here, I have seen extending to the scrobiculus cordis the day after delivery. But a more moderate degree of distention occurring during labour suspends the pains. If the accoucheur introduces the catheter in the usual way, that is, in the position F, he finds difficulty and gives pain, and thinks

there is some unusual obstruction. Therefore after inserting the point of the catheter in the urethra, he must incline his hand downward, so as to bring the instrument into the position of the dotted line.

OF STRICTURE OF THE ŒSOPHAGUS.

The direct connection of this tube with the stomach, the number of its nerves, branches of those ultimately distributed to the stomach, point out to us the reason of its so readily sympathising with the state of the stomach and intestines ; and why difficulty of swallowing from the spasmodic contractions of this tube, and why paralysis or loss of action are both consequences of disordered digestion.

The œsophagus is vascular and glandular, it is subject to injury from the bodies transmitted through it, and hence it is liable to confirmed stricture. In my Collection are two examples of strictures of the œsophagus so narrow as to cause death ; and in both these cases the contraction was occasioned by swallowing acrid and stimulating fluids. We may therefore suppose, that lesser degree of stricture of the œsophagus are to be attributed to the inflammation of the tube occasioned by injury done to it in deglutition. At the same time I can readily believe that the spasmodic and irregular action of the tube in deglutition may injure the inner coats, and produce a permanent thickening and stricture. In the early stage of this

complaint, I have found the patient's sufferings chiefly to consist in a flatulent distention of the bowels, and so frequent and urgent a necessity for evacuation as to drive him from company. While the stricture of the œsophagus is permanent the difficulty of swallowing like the difficulty of discharging the urine in stricture of the urethra, will vary in degree with the varying state of the stomach and bowels. This circumstance points out the necessity of attention to the state of secretions from the bowels, and of regulating them.— In women, the state of the œsophagus like the stomach, will have a dependence upon the uterine function, which, therefore calls equally for the attention of the surgeon.

The spasmodic contractions of the œsophagus may sometimes be relieved by the dexterous use of the bougie, but it is evident that there is danger in this, of doing a violence to the coats of the tube. These spasmodic affections will be relieved by rubbing camphor, or opium, or æther, on the sides of the neck, or even by swallowing a little of the tincture of opium. Valerian and camphor is also given, or exhibited by clyster, but the principal object must be to discover the cause of this irregular action, and to remove it ; and its seat will be found to be in the digestive organs.

For the confirmed stricture of the œsophagus both the bougie and caustic are used This is done on the analogy of the stricture in the urethra ; the caustic is strongly recommended by Sir Everard Home.

I have in this work grounded all my observations on the dissection of the parts, and as I have not had opportunities of examining this subject by anatomy, I shall reserve my opinion, only saying, that hitherto my practice has been confined to the occasional use of the bougie, and the very gentle and gradual dilatation of the stricture in the œsophagus; to the regulation of the health, and watching for, and removing that derangement of the stomach which produces more than the usual degree of viscid secretion in the throat, and spasmodic difficulty of swallowing.

Some delicacy of hand is required in the use of the bougie in this complaint; the bougie must be softened and bent in a just degree, so that meeting the back part of the pharynx, it may easily take the turn into the œsophagus. If it be straight and too rigid it will strike against the back of the pharynx and hurt the patient: if too soft the bougie will coil up in the pharynx, and give a distressing sense of suffocation. The places where I have felt the stricture are, first, just at the termination of the pharynx in the œsophagus, that is, behind the cricoid cartillage, and again where the œsophagus is opposite the upper edge of the sternum.—I am satisfied with passing the bougie twice or three times through the stricture during the interval of breathing; the patient should be firmly seated, his head leaning on a pillow placed on the back of the chair; and a language of signs established with the patient, is useful, and serves

greatly to tranquillize him, so that he will longer suffer the instrument in his throat.

CONTRACTION OF THE RECTUM.

The contraction of the rectum is situated for the most part about two inches within the anus. The attention is called to the disease by the pain about the anus, especially when at stool, and by the increasing difficulty of passing the fæces. The form of the figured stool as if pressed through a narrower passage than the anus, proves the nature of the disease.

This stricture in the rectum being complicated with hœmorrhoids, a natural consequence of the straining which it produces, is very often mistaken for them.

There is undoubtedly a stricture of the rectum of a very different nature from what is called the scirrho-contracted rectum. By dissection I have found a contraction membranous only, and differing very little from the natural coats of the intestine. In practice I have found corresponding with this fact an obstruction in the canal which could not be attributed to diseases of this nature, since the patient has lived very many years, suffering miserably, but yet with no attack on the constitution, nor progress in the malady. I have found also (but not in the dead body, which I esteem the only secure authority,) a contraction in the rectum of a considerable extent along the canal, which I have reason to suspect was either an original malforma-

tion, or it existed at an early age, as it has continued for twenty years to my knowledge.

The rectum is the seat of a more formidable stricture. The disease is of the nature of scirrhous hardening of the coats, and is, I apprehend, originally from the glands of the intestine. The coats become thick, and incapable either of dilatation or contraction. So that from the first there is a difficulty of discharging the fæces, and they come only after a great accumulation above. As the disease advances the passage is much narrowed, and at last ulceration takes place. In my Collection, preparations may be seen, which show the progress of the disease to the surrounding parts, and the same scirrhosity involving the rectum, prostate gland, and bladder.

The simple contraction of the rectum may be relieved or cured by the use of the bougie, and clysters of cold water. The bougie enlarges the passage, and acts as a suppository, and the clyster clears the gut and gives it tone, and frees it from the resting of the fæces there, which is a continual source of irritation in all complaints of the rectum. To the contraction of the rectum, which is not attended with much pain, and which is not scirrhous or ulcerated, tents may be used. But at the same time that I mention these, I must reccommend great caution in the attempt of actually distending and stretching the contracted gut.

When the contraction leaves only a narrow passage, and when only a small bougie can be passed, notwithstanding the utmost attention to keep the

bowels easy by medicine, there will be occasional obstruction and painful accumulation in the intestine above. In this case it will be of very essential service to introduce the hollow bougie through the stricture, and inject a mild clyster past the narrow part; for whether it be mucus, or hardened fæces which cause the obstruction, this practice will give relief.

It is possible to cure the simple contraction of the rectum; but as to those cures which are stated to have been made of the scirrho-contracted rectum, I have no faith in them. Much however in this case may be done to palliate and relieve the more distressing accompaniments.

OF FISTULA IN ANO.

1. A FISTULA in ano is a deep imposthumation by the side of the anus. When the matter makes its way through the skin, surgeons have called it an External Fistula; when it has opened into the rectum it has got the name of Internal or Blind Fistula; and those abscesses which have an opening in the surface, and also communicate internally with the gut, have been termed Complete Fistula.

2. Often there arise large phlegmonous boils by the side of the anus, which require to be brought forward and opened early. Sometimes a hardness and pain on passing the excrements give sign of inflammation, which tending to suppuration, gradually softens and bursts, discharging good matter. These are accidental to the part, and having no

connection with the gut, and not proceeding from irritation in the rectum, have nothing in common with the disease called fistula in ano.

3. In the cellular membrane by the side of the gut there is an abscess formed with callous secreting walls. This abscess opens by a small aperture, externally round, hard, and but little inflamed, appearing almost like the opening of a natural duct. On pressing this part a hardened cord of cellular membrane is felt, running towards the rectum. Through the opening matter and fæces are discharged; and upon examination, the side of the fistula or sinus is found to have an opening into the gut similar to that in the external skin. This is the most common appearance of this kind of fistula. This is the perfect state of the disease, if I may use such an expression.

4. Very often abscesses are formed by the side of the anus, which notwithstanding have no communication with the rectum; and when the probe does not pass up by the side of the gut, and when the finger in ano does not discover the bareness of the coats of the gut by the rubbing of the probe in the abscess, it will be sufficient to lay it freely open, and to use light dressing, and keep the bowels open and attend to the general health. There will be no necessity for cutting the gut, or of considering the disease in any other light than as a common abscess. Yet it must be confessed that, even in the case where the abscess has no connection with the gut,—we have sometimes to treat it as a complete fistula. Though the matter discharges, the external swel-

ling subsides, and the orifice becomes clean and healthy, yet the sore does not close, the disease remains offensive and troublesome, and the discharge becomes a thin acrid fluid.

5. Abscess of a very bad kind are peculiarly apt to form by the side of the anus, in consumptive people. If the physician gives up his patient into the surgeon's hands to be cured for fistula, in the first instance, when there is a phthisical cough and hectic fever, the latter may expect little reputation to result from his practice.

6. Often in reduced habits or in bad constitutions, the sore is not of a fistulous form ; there is an irregular opening, with loose flabby skin, covering a pale smooth flesh, accompanied neither by inflammation nor discharge. In this case, when the parts are freely cut, they should be dressed with balsamic and stimulating applications.

7. There are diseases of the cellular membrane and skin, by the side of the anus, of a very different kind. With fever and restlessness, attended with a hard, full, jarring pulse, there comes a dusky, red, or purple coloured inflammation, without much tension, or phlegmonous hardness. The matter formed under the skin is small in quantity, and bad ; the strength, and spirits, and pulse, sink ; and the adipose membrane becomes gangrenous and sloughy.

8. Large quantities of matter, and deep sloughs, are sometimes formed, and great devastation committed on the parts about the rectum, with little or no previous pain, tumour or inflammation.

9. The abscess is sometimes connected with disease of the sacrum or vertebræ, and is of course out of the reach of remedy by operation.

The psoas abscess sometimes falls down and points by the side of the anus.

Having perused these observations, my reader will have drawn this conclusion: that besides the true fistula, there are many other complaints seated here, the origin of which are in the constitution, or in the peculiar nature of the parts, or in these conjointly; and that, consequently, the treament of these must be under the guidance of a different principle.

I conceive the state of the bowels favouring the formation of fistula to be this; there is a slowness and irregularity in the function of the whole canal, and accompanying the torpor which is general through the abdominal viscera, there is a dryness and want of secretion in the rectum, a defective action in the rectum, and consequent on this, an unusual resistance of the sphincter ani during the expulsion of the fæces. Then follows fulness in the veins at the extremity of the gut, and inflammation and thickening of the verge of the anus; so that the extremity of the gut is in a state nearly approaching to that of stricture.

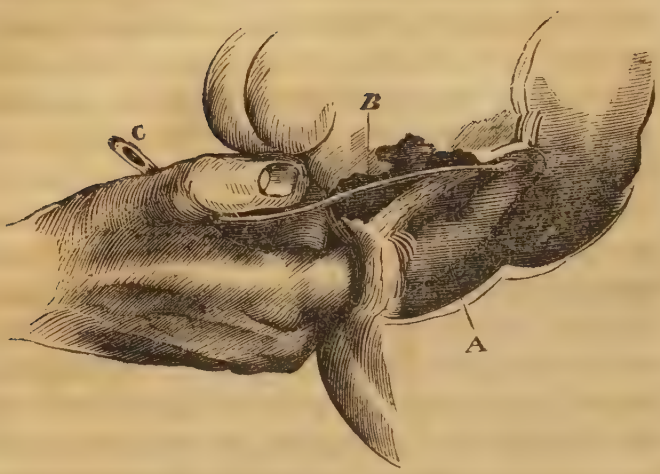
This state continuing, there is an irritation excited in the rectum, and a suppuration on the outside of the coats of the gut; the matter of the abscess descends by the verge of the anus, and makes sinuses in the loose cellular membrane of this part; ulceration makes a communication be-

twixt the rectum and the abscess; the abscess opens on the surface, and the fistula in ano is complete.

When the fistula is formed by communication with the rectum, and before the opening is formed in the integuments, it has been called an internal or blind fistula, of which these are the marks: when a hardened stool is passed with difficulty, and the fæces are streaked with matter, on examining the margin of the anus, a hardness is felt, and on pressure matter passes from the extremity of the gut. When the finger is introduced into the anus, the gut is felt to pit as it were on the diseased side, and the matter being pressed out, the membrane of the gut falls in upon the abscess. The disease is accompanied with pain, and tumefaction in the extremity of the gut, which suddenly subsides after going to stool, the abscess being evacuated into the rectum.

No sooner has even the merest tyro introduced his finger through the anus, in the complete fistula in ano, and felt the constriction of the orifice, or probed the depth of the sinus opening by the side of the anus, and found it running by the side of the thin coat of the rectum, than he perceives the impossibility of laying open the diseased parts to the bottom by any other form of incision than cutting across the sphincter muscle, relieving this constriction, and making the sinus and lower part of the gut one surface.

OPERATION.



A, the finger introduced into the rectum; B, the fistula; C, the probe passed first through the external opening, secondly through the sinus and fistula, and lastly into the gut; D, the rectum.

1. Let the bowels be emptied and brought to an easy state previous to the operation: immediately preceding the operation, the lower gut may be cleared by a clyster.

2. The patient is placed with his back to the light, and then made to stoop very low, and to rest his head on a low bed or seat; or he may be put in the position of lithotomy, with his buttocks raised on a pillow, and his legs held asunder.

3. We have in the first place, to examine the course and extent of the sinus, by introducing the probe bent, so as to pursue every labyrinth, should extensive sinuses occur.

4. The operation should be deferred, if there is much irritation and inflammation; and the patient in the mean time should be made cool and easy by repose, mild laxatives, and cataplasms or fomentations to the parts.

5. Having made ourselves so far acquainted with the sinus or abscess, with a little oil on the fore-finger of the disengaged hand we introduce it into the gut. Now, by moving the point of the probe over that surface of the abscess which is next to the gut, it is felt by the finger and will be made to slip into the communication betwixt the gut and cavity of the abscess. We have now to examine whether the disease does not extend further up by the side of the gut than this hole of communication.

6. The operation is exceedingly simple in these circumstances. A directory is introduced instead of the probe, from the external orifice through the sinus, until it enter the gut. Along this the probe-pointed bistory is passed, until the point rests upon the finger, when the directory is withdrawn. The finger being in the rectum, with the point of the bistory thus pressed against it, both are withdrawn, and the intervening part betwixt the gut and sinus, is by this means cut through.

7. In introducing the knife, there is no necessity that the directory should be previously introduced,

for with the point of the bistory groping against the finger in the gut, the communication may be found; and even this communication is of littte consequence if we are sure that we lay open the gut to that point, and make our incision extend as far as there is felt a thin membrane, only betwixt the probe and the finger. In this operation there is seldom a necessity for any other instruments than the probe-pointed bistory, the probe, and the directory. If the patient refuses to admit an assistant, and the side of the gut is to be perforated, the fistula, knife (which is a union of the probe-pointed and sharp bistories) must be used.

8. Sometimes the fistula in ano is by no means so simple as I have described it; but, on the contrary, besides the sinus communicating with the gut, there run callous fistulæ in the perineum, and towards the hips. These we should endeavour to lay open, and cut off the angles which are formed in the skin by the incisions. When they penetrate and run deep, their mouths must be scarified so as to produce an action on their surface, rousing them to activity; after which we have to endeavour to promote good suppuration and the rising of granulations from the bottom.

When the disease is of the nature of the internal fistula, it is made complete by thrusting the abscess lancet into the hard margin of the anus, the hardness indicating the neighbourhood of the sinus. But it will be better, after ascertaining the nature of the disease, to endeavour to find the opening of the gut, which in this case being the sole opening,

is generally free. We may do this by introducing the probe, with about an inch or more of its extremity, bent almost entirely back on itself. The probe is carried flat upon the fore finger; and where the finger feels the inequality or hard margin of the communication, the end of the probe drops into it, and then the probe being drawn, the point appears by the side of the anus, and with the knife, we can cut upon it. Then the parts being in the state of the perfect fistula, the operation is completed by the probe-pointed bistory being made to follow the probe, and by laying the gut and sinus into one cavity.

If in our examination of the fistula, the intestine feels bare, and the probe is felt distinctly upon the finger, we may thrust the probe through the gut, and proceed as if there had been a communication.

OPERATION WITHOUT USING THE KNIFE.

Various methods have been in use as appears upon the very oldest authorities of curing the fistula in ano without cutting with the knife. And some of those will continue to be practised from the natural horror of the knife.

There is a manner of dressing the fistula with escharotics towards the gut which at last but tediously and with pain, lays the fistulous sore and the gut into one cavity.

The method of operating with the ligature may be substituted for the operation with the knife.

In some cases it is even preferable. An operation with the ligature was described by Celsus, and continues to be practised by quacks. The method of Foubert will be preferable in some constitutions to the operation with the knife, especially when large incisions are otherwise required.—Foubert's operation was to pass a piece of leaden wire into the fistula, and bring it out by the anus, and by twisting the wire gradually to cut through the substance intervening betwixt the fistulous sore and the anus. The ingenious surgeon will find no difficulty in introducing the wire. Take the fol-following method as an example.

OPERATION WITH THE WIRE.

Have a small silver canula curved towards one end, and of calibre just sufficient to let a piece of leaden wire be passed through it. Have a probe adapted to the silver canula, so that the point of the probe projects from the end of the canula, and is smoothly fitted to it.

1. Introduce the canula with the probe into the fistulous opening. 2. Introduce the finger of the left hand into the rectum. 3. Seek with the point of the instrument for the passage betwixt the fistulous cavity and that of the gut, and introduce the end of the instrument into it. 4. Now withdraw the silver probe, and introduce the leaden wire through the canula. 5. A second time introduce the finger of the left hand into the rectum, and catch the end of the leaden wire with the last

joint of the finger, and pull it down until it appears at the anus, then withdraw the canula. 6. Now twist the ends of the wire, and cover them with a little lint.

The dressing consists merely in twisting the wire a little every day, so that at last it cuts through the same part which is divided in the operation with the knife. The more gently and gradually the wire is twisted, the less pain the patient will suffer, but the slower will be the cure.

FISTULOUS COMMUNICATION BETWIXT THE RECTUM AND VAGINA.

In women there occurs a very severe complaint of the nature of fistula in ano. A communication is formed betwixt the rectum and the vagina. This is a disease which probably proceeds from some foreign body lodging in the rectum, or from some injury received in labour. After this has been examined, and all source of irritation removed, for bones and shells have been known to occasion it, I imagine, that by scarification and dressing, it should heal; or, perhaps it may be effectual to lay open the rectum up to the fistulous communication without laying the rectum and vagina into one; or we pass a seton from the rectum into the vagina, which prevents the lodgement of matter, and stimulates the sore to heal.

We may contrive to draw this seton gently, by tying the two ends, and including a dossel of lint, so that this compress may lie upon the perineum.

If in doing this we find that, as the seton is brought lower, the ulcer is healing from above, we may proceed until it cuts its way out.

OPERATIONS FOR THE FISTULA LACHRYMALIS.

The Fistula Lachrymalis is a disease of the lachrymal canal.—In what may be called its complete state, there is an obstruction of the duct which carries the tears into the nose, and a fistulous sore discharging the tears and pus near the inner angle of the eye; the patient only complains of a weakness of sight, the eye is watery, and on every little excitement the tears fall over the cheek, which is sometimes excoriated; the nostril of that side is dry. But this complaint will not admit of a description in the form of a definition; in common discourse we call all the various degrees of the disease of these passages, which might in a latter stage form an open weeping sore, fistula lachrymalis.

1. The first state of disease I shall describe is this: the eye is considerably inflamed and irritable; the edges of the eyelids are tumid, and the glands secrete profusely; the internal membrane of the eyelid is very red, and flakes of mucus are seen upon turning down the eyelid; the integuments over the lachrymal sac are full and puffy, and on pressing there, mucus and pus escape from the puncta. To account for this appearance, there is no occasion to suppose that there is an obstruction in the nasal duct, the disease is a general inflammation of the surfaces and ducts, and all the

continuous surface of the eyelids, puncta, sac, and duct, are unusually vascular and spongy.

The natural resource against such symptoms is to endeavour to subdue and counteract this general tendency to a chronic inflammation in the whole mucous membrane and ducts. This is not the place to enter into the subject; but let me here remind my reader that he does nothing, if he does not now endeavour to discover the fault of the constitution or the accidental derangement of the viscera, which has occasioned inflammation in the membranous appendages of the eye. In aid of the general treatment by astringent injections or collyria the general relaxation may be removed, and the soreness and swelling of the eyelids relieved by the citrine and tutty ointments; then the sac and ducts must be kept also clear, pressing out the accumulated mucus, and injecting into the ducts until the fluid passes into the nose.

2. When there is not only a watery eye, and tumid eyelid, but a distinct tumour of the lachrymal sac and an excoriated cheek, something must be done to make the duct pervious. In this state of the disease, it seems to be ill-judged practice to endeavour to give firmness and resistance to the sac, to make it contract, by cutting open and stuffing it with dressing. This is the same as if a surgeon would continue to scarify and dress a fistulous sore in the perineum, after he knew urine was discharged from it, and that there was an obstruction in the urethra. The only questions to

be determined on previous to the operation are these: 1. Is this a disease owing to a general sponginess and thickening of the mucous membrane? 2. Has this general diseased state terminated in a particular stricture, or obliteration of the lachrymal duct? 3. Is there a stricture, or obliteration of the passage which has been the primary cause of the symptoms, and still keeps up the disorder?

But even the answers to these questions are of no great importance, because if an operation is to be done, the entire operation is not more severe, or troublesome, than a more partial attempt to cut into the sac and make it contract and fill up. If it should be found that a more general disease of the membrane prevails, or even if the constitutional derangement be proved to be the original cause, this only teaches us to be careful to correct the slight and chronic inflammation of the surface, after the course of the tears is established, and during the progress of the cure, by attention to the general and local treatment.

Much of the distress accompanying this disease is occasioned by the excitement which the suppurating sac gives to the eye; and that again is a consequence of the absorption still continuing by the puncta, after the duct is obstructed—for if the sac be closed up and obliterated, and there be no disease originally in the coats of the eye, a great deal of the irritation and even the watering of the eye will subside—and if the puncta be closed, so will the inflammation of the sac subside, because it

has no longer the irritation of the acrid tears. Accordingly it has been formerly esteemed a regular operation to obliterate and fill up the sac. This by removing the principal cause of irritations relieves the watery eye, and brings it to the simple case of obstruction of the duct, which when unattended with suppuration, produces little distress.

The intention of the following operation, however, is to restore the course of the tears into the nose, and entirely to cure the disease.

1. The patient is placed before the surgeon, and they are both seated. The patient's head is supported on the breast of an assistant, who stands behind him. The surgeon applies his thumb to the eyelids, and stretches them from the inner angle, so that the small tendon of the orbicularis muscle is made particularly distinct. Beginning his incision by piercing the skin just below this tendon, he carries his small knife in a semicircular direction, (*viz.* following the curve of the edge of the orbit).

2. Having made this incision in the integuments, he thrusts the point of the knife deeper so as to penetrate the sac, and slit it downward.

3. If the fistulous opening be free enough, it is better to introduce into it a small probe, and following the probe with a sharp pointed bistory, to cut open the sac. The next part of the operation is to pierce the bone with the stilette.

4. In piercing the bone, we have in the first place to take care that the point of the instrument be lodged within the natural sac before the per-

foration is made; for if it is not, as I have known it happen, the latter treatment will only serve to obliterate the sac, and I believe to close the tubes leading from the puncta.

5. Now, if the young surgeon does not perfectly recollect the relation of the *os unguis* to the nasal process of the upper jaw-bone, and if he points the instrument directly into the nose, he may chance to hit upon the very strong process of the maxillary bone. But if after being fairly in the natural sac, and of course with the point beyond the sharp ridge of the maxillary bone, which forms the margin of the orbit towards the nose, he carries on his point obliquely downward and inward, he comes to be opposed only by the thin plate of bone, (as delicate as a piece of paper), which is called the os unguis, and now he will find this part of the operation very simple indeed. By keeping the side of the instrument pressed upon the nasal process of the maxillary bone, and carrying the point forward it will pierce this thin lamina of bone the *os unguis*, and then the point should be more turned towards the cavity of the nose, so as to enter it just before the lateral cells of the ethmoid bone and above the lower spongy bone. That we are right in the direction of the instrument, is known from the very slight resistance which we meet with, and the flowing of a few drops of blood from the nostril, or which may fall into the throat, according as the head is thrown backward or forward.

6. The instrument being withdrawn, a piece of leaden wire is introduced. This, being worn for a

week or a fortnight, is taken out and replaced by a piece of bougie. In the course of two months, when the passage is become like a natural canal, the bougie is withdrawn and the wound allowed to heal; and the tears which have been all this time absorbed by the puncta and carried into the sac, and have passed by the side of the bougie into the nose, continue, upon its being withdrawn, to run by this new passage into the nose. The perfection of the cure is ascertained by the eye having no more than its natural moisture, and that side of the nose which was before dry having now as moist a discharge as that of the other side.

This operation keeps the patient a long time under the surgeon's hands; and there is considerable inflammation and suppuration kept up by the lead wire or bougie.

The following is the method of Mr. Ware. Having opened the sac, or supposing that it has been opened by ulceration, he introduces the blunt end of a probe, (of a size rather smaller than the common dressing probe,) and pushes it on gently and steadily in the course of the natural duct. He overcomes the obstruction by force, and he passes the instrument into the nose by the nasal duct. The full descent of the point of the probe into the nose will sink the instrument fully an inch and a quarter.

The probe being withdrawn, a small silver style of nearly the same size of the probe, and with a flat head, which is to prevent its sinking altogether into the nose, is now introduced, and the

operation is finished. This little style, passed down into the nose, keeps the duct permeable, while its head being covered with black wax, or a bit of court plaister stuck upon it, has every appearance of a common patch.

This operation is ingenious, whilst its simplicity ensures success. It is not followed by the high inflammation and quantity of matter which will sometimes follow the use of the bougie in the operation just described, and does not therefore endanger the closing of the upper part of the sac or puncta, while from the beginning there is neither confinement nor unseemly dressing required.

Few people, however, will submit to a palliative remedy, such as this operation is, when it is intended that the style shall remain in the nose, and if the operation be performed with the intention of removing the style, and closing the sac, I would recommend that it should be performed as first described, *viz.* by piercing the os unguis, and then substituting the style for the bougie, with the expectation that the patient will submit longer to its use. By this means while the patient enjoys comfort during the cure, he has the better chance of its being perfect in the end.

Since it is found that the new passage is more easily established than the old, why not thus combine the means of cure? Perforate the bone, and instead of the rude piece of lead wire, let it more resemble Mr. Ware's instrument, and be worn with less deformity or inconvenience.

Whatever operation we perform, we must withdraw the bougie or style, and occasionally wash the passage by means of the small syringe. This prevents the lodgement of matter, and the formation of abscesses.

From what has been said above, it will readily be understood that during the cure we must carefully attend to the state of the conjunctiva, and the general secretion of the eye.

It will now appear to my reader, that there is in the modern practice nothing which conveys a very marked superiority over the operation of Wathen; which was to introduce a small gold tube into the duct, and heal the fistulous sore over it. If the tube were at last to fall into the nose, would it not, in that event, have effected a cure as surely as the instrument of Mr. Ware?

Scarpa has thought it necessary to recommend, in a particular manner, that the sac should be dressed with escharotics to the bottom. The presence of the bougie in the passage is sufficient to inflame and cause the due contraction of the sac. He has thought it necessary also to recommend the use of the actual cautery, to destroy the os unguis, when a new passage is to be formed; a thing which I think I can say with confidence, is never necessary, and must be kept altogether out of the enumeration of our resources.

OPERATIONS FOR SALIVARY FISTULA.

The salivary fistula is of a nature altogether different from what we have been hitherto considering. It is not a consequence of obstruction in the natural ducts, but of a wound or ulcer, which opens the duct, and permits the saliva which should be conveyed into the mouth, to be discharged outwardly. The salivary fistula chiefly occurs in the cheek from Steno's duct being exposed to be cut across in wounds of the cheek.

It is usual to distinguish the parotid fistula, as it occurs from a wound of the gland and of the duct.

The fistula from the gland will be recognized from its situation, the opening will be before the ear, or behind the upright part of the lower jaw, and the nature of the sore will be known by the clear saliva which flows from it, and the increase of that discharge, upon taking food. To cure this kind of fistula, it will only be necessary to make the opening sore by caustic and stimulating dressings, and to compress the wound effectually and perseveringly.

The fistula of Steno's duct is a very troublesome complaint; like the other, it is occasioned by a wound of the cheek, which divides the duct, and consequently lets the saliva flow over the wound, preventing it from closing, and consequently forming a weeping, or fistulous sore. While the patient is sitting at dinner, and while

speaking, as well as when masticating, the flow of saliva is very profuse and troublesome.

If there occur a recent division of the duct, by a wound penetrating the cheek, near its termination, we have only to take care that in using the twisted suture, the skin of the cheek be very accurately united, while the inside of the cut is left free, for the discharge of the saliva, from the duct, into the mouth. When we do this, the duct may chance to unite again, or though it do not, yet if the outward skin be united, the saliva will find its way into the mouth.

The probability however is, that the case presents in the form of a callous hole discharging saliva. In which vain attempts have been made to cure the sore, by compresses, and escharotics. The duct may have been divided, as it passes over the masseter muscle, and of course without the wound penetrating the mouth.

OPERATION.

In this case, the first object will be to make an opening into the mouth. This will be best done by passing a needle and seton from the fistulous sore, forward betwixt the integuments of the cheek and the masseter muscle, and through the buccinator muscle into the mouth. The seton thread will require to be a fortnight or three weeks introduced, before the communication will have become a callous canal. When the communication betwixt the opening in the cheek and the

mouth is established, we may proceed to the second part of the operation, which is to close the outward wound. For this purpose, there is a fine management of the seton necessary. It must not now be brought altogether through, but with a thread or hair the seton is drawn from the mouth, so as to lie in the inner part of the passage; but it is not to be brought out through the integuments of the cheek, but only the fine thread which is attached to it, is brought out at the wound on the cheek. By this means the passage into the mouth is preserved large, while the outer wound contracts; when the hole in the cheek has become very small, let the fine thread be cut short, and pushed within the opening of the cheek, or the seton, which is in the mouth, be drawn until the thread disappears from the outward wound; but let the seton remain in the mouth as long as it will, or until the outward wound is healed. The closing of the wound may be promoted by exciting it, and using a compress.

This operation of the seton may be done, with the further precaution of cutting the lips of the fistulous, opening with a knife, and uniting the lips by the twisted secture.

The circumstances of the case, may permit a very different method of cure, viz. by a tube introduced into the duct. The first attempt will be, to pass a small silver probe from the mouth, into the natural opening of the duct, and to enlarge it, if it has contracted by want of use; then to substitute a small tube, which being introduced

from the mouth, shall also pass some way into that part of the duct, which discharges the saliva upon the cheek. Lastly, while the tube is retained in its place, the outward lips of the wound are to be made raw, or cut, and brought together and united.

In attempting the healing of the fistulous sore on the cheek, there are two circumstances worthy of attention; the first is, that compression may be so made behind the fistula, as to prevent the flow of the saliva; the other is, that the jaw must be kept fixed.

I can foresee occasions where it may be necessary to vary the operation, but the principal is evident, and the manner must be left to the operator's ingenuity.

RANULA.

This is a tumour in the mouth, which impeding the motion of the tongue and making the voice raucous, and like a frog, it has got the name of Ranula or *Grenouillete*. Some will have it that this name is given to it, because it resembles a frog's belly.

Ranula is a semipellucid tumour lying under the tongue, and in its commencement by the side of the frænulum linguæ. It is described as having its origin in the obstruction of the salivary glands; and accordingly it is not confined to the seat of the sublingual gland, but appears sometimes in the cheek, in the place of the parotid duct, and then it is more fleshy and vascular. It

is described as beginning without pain, the feeling of distension being alone troublesome. Such indeed has been the account of the patients I have seen with this complaint; but I know that an obstruction of the salivary ducts is an extremely painful complaint, and so peculiar in the pain and distension of the salivary glands, under the tongue, upon tasting sapid food, or on the action of the muscles of the jaw, that the patient would not be apt to overlook the beginning of the disease.

If we say that Ranula is a semipellucid tumour, like a frog's belly, under the tongue, then there are two kinds, the one arising from the distension of the salivary duct; the other, a simple incysted tumour. I believe they have been much confounded. If we define it to be a distension of the salivary ducts, then it is not always under the tongue, but is common to the other ducts. This complaint, under the tongue, I have seen in an infant, and I believe it is frequent in them, from original obstruction of the duct. In adults, it is sometimes found to be complicated with, and to have taken its origin from salivary calculi in the mouth of the duct.

When it is in its most frequent place, under the tongue, and is allowed to grow, it forces back the tongue, and occasions difficulty of swallowing, and inarticulate speech; and in children it prevents sucking.

It would appear that this is sometimes a much firmer tumour than those I have seen, in so much, that, by pressing forward, it has affected the teeth,

and so far pressed back the tongue, as to occasion difficulty of breathing. When formed in the cheek, it has forced itself under the zygoma, and has prevented the free motion of the jaw.

The practice is, to lay these tumours freely open. Unless this be done largely, the tumour will return. In its return it will often lose its transparency, and by the necessity for frequent punctures, it becomes a thick and fleshy bag, requiring complete extirpation if it be then practicable.

Calculi form in the salivary ducts; sometimes they lodge near the mouth of the duct, without producing a tumour, and then with a touch of a lancet over the extremity of the duct, they may be drawn out with forceps; the calculous produces much irritation, and sometimes a suppurating sac is formed. After the extraction of the calculous, the injection of a slightly astringent fluid, with the syringe for fistula lachrymalis, may be advisable.

OF FISTULOUS SORES.

I consider the true fistula, as manifestly distinguished from a callous sinus, the consequence of a wound or ulcer. The fistula, properly so called, discharges preternaturally a natural secretion, as the urine, the saliva, the tears, the matter of the intestines. I do not apprehend that the name could have arisen from the ulcer, resembling a pipe, but rather from its being an ulcer discharging copiously (perhaps from fundo). How-

ever we may consider the matter, the distinction into fistula properly so called, and callous sinuous ulcers is, practically correct, and necessary. In the true fistula, without removing the cause, no general or local treatment will avail any thing. Whereas in the callous sinus, if there be no foreign body in the wound, our attention ought principally, and in the first instance, to be directed to the disorder of the system.

A collection of pus having no outlet is an abscess, which bursting and contracting its cavities becomes an ulcer. When the openings of this abscess or ulcer lead into narrow cavities, it is a sinus; and when the sinus becomes stationary, having callous sides, secreting a thin matter, the sinus has become fistulous, resembling in some measure the true fistula.

This is a change sometimes occasioned by neglect, or bad management of the dressings; but oftener it is owing to intemperance, or irregularity of the patient, or debility, or distempered constitution. Therefore before thinking of opening such sinuses, the attention must be turned to the patient's condition; perhaps we find reason to attribute much to confined impure air, bad clothing, filth and bad diet; or observing his pallid countenance, his nightly feverish condition, the state of the bowels, the secretions from them are to be corrected, before the knife is to be thought of.

The imperfect suppuration attending an erysepilous inflammation will sometimes destroy the

cellular membrane, and when the slough is drawn out in shreds from under the skin, a sinuous or fistulous ulcer is left; instead of opening such an abscess or cutting off the diseased portion of skin, we must set about examining the patient's constitution, and discover what he has suffered, he may be a London citizen, in whom indulgence and confinement together have operated to injure the constitution. He may come from the east, or the west; from the marshes of Walcheren, or the hardships of a Spanish campaign, we must look back to the fevers from which he has recovered, to the hardships or privations which he has suffered, and discover the occasion of his broken health.

SECTION III.

OPERATIONS TO REMOVE NATURAL DEFECTS.

PHYMOSIS.

THE preputium is sometimes found defective in its original formation. I have seen it with an orifice so small, that the urine had not a free outlet: so that when the boy made urine the preputium was distended like a bladder. For such a malconformation the operation of phymosis is to be performed. It often happens that the edge of the foreskin is tight and inelastic, to the degree of preventing the glands from being exposed. And for this also, when the patient arrives at manhood, he will desire to have the operation performed. There is a lesser degree of tightness in the preputium that is attended with very distressing consequences; for the foreskin can be brought back over the glans, but cannot be returned, and the stricture of the foreskin now girding the neck of the glans, that body is distended

with blood, inflames, and the very worst consequences are to be apprehended from the strangulation of the glans: this is the state called *paraphymosis.*

There is yet another consequence of the phymosis, which produces very great distress. It is a state of disease which I do not see any where noticed. There is a great disturbance of the bladder and urethra, great irritability, and inconceivable anxiety of mind, the glans is firm and smooth, like a part that had suffered inflammation rather than distention and strangulation. These are consequences of a stricture of the prepuce much less in degree, I may say the fourth in degree. During erection, or whilst in connection, the glans in its extreme distended state, is girded and injured by the margin of the preputium. The patient is not conscious of the occasion of his great suffering, and imagines it to be a disease in the urethra. The prepuce ought immediately to be cut in this case, if there be a possibility that it is the cause of these distressing symptoms.

OPERATION FOR PHYMOSIS.

Introduce the probe under the foreskin, and bearing the point of the probe upwards, withdraw it: you will then be sensible that the stricture is not in the whole extent of the foreskin, but only in the inner reflection of the skin, and only on the fore part or margin of the foreskin. It generally happens that the foreskin is not of equal length all round,

so that the opening of it is not opposite to the extremity of the urethra. The operation is a very simple one. The foreskin is to be slit open towards that side which is opposite to the extremity of the urethra. If the nature of the stricture has been attended to, it will not be necessary to cut much of the outward skin.—Introduce the probe frequently, so as to distend the prepuce, and get a knowledge of the place and nature of the cord which resists ; then take a sharp pointed bistory, introduce it with its flat side to the glans, then turn up the edge and insert the point into the inside of the prepuce, resisting the point with the forefinger of the left hand placed on the outside of the skin. But in doing this, take care that the point of the instrument does not at once transfix the foreskin, but that it only pierces the inner reflection ; and now, moving the fore-finger of the left hand, push back the outer skin, until only a small part of the margin of the foreskin is left before the point of the knife ; then push the knife through, and turning the point towards you, draw it as a woman would her needle. If this cut does not set free the preputium, so that it can be drawn back, we must examine if there be any remains of the corded margin, and if not, if it has been fairly cut through ; then we must make a cut upon the margin of the foreskin opposite to the first, and similar to it.

Some will prefer doing the operation at one decided cut of the sharp-pointed bistory, laying the preputium open upon the upper part, from the margin to the point opposite the corona glandis.

There is an instrument called the phymosis knife, which is a union of the directory and sharp-pointed bistory; the latter lying concealed until raised and pushed forward by pressure of the thumb. This instrument is introduced into the foreskin, and then the pressure being made on the lever of the sharp-pointed knife, it is pushed forward and raised at the same time so as to cut through the skin. When the knife is thus raised from the groove of the other part of the instrument, (which serves as a directory,) and when the point has pierced the foreskin, the instrument is to be withdrawn, the knife still being kept elevated, and cutting itself out, the preputium is laid open.

I have often cut the preputium in the middle, not on the sides, the patient preferring it to the double incision; and the two flaps have contracted in a way natural enough. It will, however, be observed, that a larger branch of the veins is apt to be cut in this way.

When the parts are not previously inflamed, when we are operating for a natural phymosis, there happens a thing which those operating on the diseased state of the parts are not aware of, namely, the separation of the two lamina of the skin. In this case we take our smallest needle, and make a stitch with a common thread, drawing the skin together at the angle or termination of the incision; and if there is troublesome bleeding, (at least disagreeable if not alarming to the patient,) we include the bleeding orfice in this

slight stitch, which is to be cut away on the removal of the dressings.

Phymosis is often an effect of inflammation of the preputium; and when the inflammation has subsided, bands are left, presenting an appearance not unlike that which we observe in the natural and original phymosis. These bands may be cut across, and the operation may be conducted in the manner already described.

But it is to be observed, that a thickening and general loss of elasticity, is sometimes the consequence of inflammation, which requires the prepuce to be slit up.

We should, if possible, avoid cutting the prepuce when inflammation and swelling is actually present, the more especially if the general health is much deranged.

PARAPHYMOSIS.

The paraphymosis is a strangulation of the glans penis by the preputium. The preputium being tight, but forcibly drawn over the glans, the latter swells under the girding of the preputium, and by the swelling, the pain, and distress, and difficulty of reducing the glans, is encreased.

The stricture being occasioned by the band in the margin of the prepuce, both the glans penis and the integuments swell so that it is not easy to get to the stricturing band to cut it across. This inclines the surgeon to make violent efforts to re-

duce the glans by pressing the glans with his thumbs and drawing forward the prepuce with the fore and middle fingers. I have met with surgeons who boasted they had never seen an instance of phymosis which they were unable to reduce: this is a foolish boast; for the question is, will it not be preferable to relieve, and at the same time cure, the patient, by cutting across the stricture, rather than to reduce the glans, giving insufferable violence, and doing real injury to the part?

First, let us try, by gently and uniformly compressing the glans, to diminish it; then let us endeavour to push it back, and at the same time bring forward the prepuce; but if this does not succeed without much violence and pain, let us cut across the stricture.

To accomplish this, we must first wrap a piece of wet linen around the penis, to compress it and diminish the swelling, that the stricture may be more distinctly seen. If we can then introduce the point of the fine directory under it, we have only to pass the sharp-pointed bistory along the directory, and then drawing it, cut across the cord that binds the glans. But it will not be always possible to introduce the directory, and we shall find it necessary to use the sharp pointed curved-bistory without its guard.

Having cut, we again use the probe, to be sure that all stricture is taken off the glans, for the state of the integuments does not always admit of the immediate reduction we may have been led to expect. Emollient fomentation is the best application

after this operation, or rather after the injury and pressure which the parts have suffered.

THE URETHRA OPENING BEHIND THE GLANS.

This is a very common malformation. In the adult we may attempt to remedy the defect by perforating the glans and obliterating the orifice behind: but it will be a difficult operation; I have refused to make the attempt in a boy.

There is a kind of malformation which necessarily makes parents very unhappy; a considerable part of the urethra is without the covering of the corpus spongiosum, and the prepuce is tied down to the scrotum. The boy is forced to make water like a girl, and the urine comes from the scrotum as from betwixt the labiæ. I have so far remedied this defect, that the little patient has been able to wear breeches and make urine like other boys, and go to school, which he could not do while he sat down to make water. I did this by dissecting up the penis from its connection with the scrotum, and tying it up by compress and bandage during the time of cicatrization.

THE FRENUM SHORT.

There is a lesser kind of malformation which is painful and inconvenient, I mean the shortness of the frænum which binds down the glans, so that in erection it throws the point of the urethra backwards; it also breaks and ulcerates, or tears

the glans, and occasions ulcers which are at times suspicious. From the frenum tearing and opening the surface, shancre is more apt to take place here; and such ulceration has sometimes destroyed the frenum altogether and removed the inconvenience. Dionis quaintly says, he does not advise this mode of cure.

The necessary operation is no more than to pass the sharp pointed bistory under the frenum, and pushing the knife forward, the frenum is cut through. Care must be taken to keep the surfaces apart during the cicatrization.

THE DIVISION OF THE FRÆNUM LINGUÆ.

There are few surgeons who have not cut the frænulum linguæ. Notwithstanding this, I venture to say that it is never absolutely necessary. There may be an expediency, when the surgeon has not weight enough with the mother to convince her that her child cannot be prevented from sucking from this cause, but we ought not to yield to importunity. Sucking is effected chiefly by the motion of the lower jaw; and the tacking of the tongue to the gums, will not prevent the motion necessary to sucking. I doubt even whether this tying of the tongue will impede the speech. But at the age, which has imperfection of speech as the motive for the operation, I have less objection to it. In infancy the consequences have been ascertained to be suffocation from swallowing

the tongue, and death from sucking, and swallowing the blood during sleep.*

The celebrated Petit gives us examples of children dying from swallowing their blood, and it occurred in the practice of a late surgeon of London, that, having cut the frænum linguæ of an infant, it died. The operation being performed, the mother put the infant under her cloak, and when she arrived at home the child was dead, and the blood was found in its stomach.

To do this, or any other little operation under the tongue, an assistant, having the child on his knee, puts his fingers into each side of the mouth and under the tongue so that he pushes it up. With blunt-pointed scissors, the surgeon cuts the membraneous part of the frænum, taking care to avoid the larger veins, and that in the motion of the child he does not cut into the substance of the tongue so as to touch the ranine arteries, or veins.

OPERATION FOR HARELIP, AND FOR CANCER OF THE LIP, &c.

The operation for the extirpation of tumours and ulcerations from the lips being nearly the same with that for the remedy of natural defects, I shall treat of them both in this place.

When the lip is the seat of cancer, the disease seems to be less virulent in its nature, than when in any other part of the body, or it is altogether a different disease. What is particularly deserving notice

* See Anatomy, Vol. iii.

is, that it arises from some accidental irritation, and is kept up by the incessant motion of the part. And this, too, I believe to be the reason why the disease is so frequent in the lower lip, and in the angle of the mouth, for the upper lip has least motion. While other remedies have been applied, to cure ulcerations here, I have always strongly recommended the use of an adhesive strap, to retain the lip as much as possible from motion. And this fixing of the lip is the advantage gained by poulticing such sores. My attention was drawn to this circumstance, from observing that in very bad cases, some of the slighter ulcerations situated by the side of the greater diseased portion, and which could not be included in the portion cut out, healed while the pins were in the lip. I naturally conceived this to arise from the perfect repose of the lip, and not in any other way, as a consequence of the operation.

The most frequent beginning of this cancer of the lip, is an irregular warty excrescence with a broad base, or an obscure tubercle within the lip. When a sore, or disease is spreading, from such a commencement, I would not delay extirpation.

I need here only state the fact, that venereal ulcers have been cut out of the lip, being mistaken for cancers, and that the disease has broke out again, and yielded to mercury. This will be a sufficient caution, to make us examine both the history of the disease, and the concomitant symptoms, before we operate.

OPERATION.

The instruments for this operation which are to be found in the shops, I have always rejected. The pins I use are the common sewing needles dipt in a solution of gold; after being thus gilded it may be necessary to touch the point upon the sharpening stone to give it a sharp cutting point. These needles may be held in the portaiguille, or they may be inserted in a piece of cleft stick and tied in, which makes a neater instrument. The forceps for retaining the lip is a very clumsy instrument; it holds the lip with unequal pressure, and it slips when the lip is bloody.

The following method I prefer to the common one of using forceps. A flat piece of wood is shaped to go down betwixt the lip and the gums, having a rude handle which the assistant holds, at the same time that he stretches the lip upon it, and presses the lip down upon its edges so as to prevent the bleeding of the labial arteries.

Now the surgeon thrusting his tenaculum or hook into the diseased part, makes an incision on each side, down to the wood, taking care that the lines of the incisions meet so as to make a neat angle, while a triangular portion of the lip, including the whole of the disease, is cut out.

The nicety, if there be any in this operation, consists in adapting the two incisions, so that the cut surfaces may come accurately together, without puckering or ruggedness at the angle.

For example, if the incision of one side should be in a curved direction, and the other more direct, the effect will be, that when the parts are brought together, the side with the curved incision will be deeper than the other.

Fig. 1st.

Fig. 2d.

The triangular piece being cut away, the assistant withdraws the piece of wood on which the incisions were made, and holds the two portions of the lip, betwixt his fingers and thumbs. Then bringing them together, and applying the surfaces accurately to each other, the surgeon introduces his first needle about a fifth part of an inch from the surface of the lip, and rather towards the inner part of it; the other (for two are sufficient) is introduced in the middle betwixt this and the lower part of the cut.

Fig. 1. represents the appearance of the incision when the parts are cut out.

Fig. 2. represents the pins introduced, and the divided lip brought together.

The surgeon should now put two or three turns of the ligature about the pins, until the bleeding stops altogether. Then loosening it, he should more accurately wind his thread about the pins, by throwing the middle part of it over the two extremities of the upper pin, then crossing the threads and returning them so as to form the figure of 8. Having done this with the upper pin, he proceeds in the same way with the lower.

When two or three turns of the thread are put around the pins, the surfaces of the lips must be accurately adjusted, and the threads finally fixed.

In making the twisted suture, the lip is more frequently too firmly braced, than not brought together sufficiently. When the ligature is drawn to stop the bleeding, as in the first instance, and not afterwards loosened, but the operation thus finished, the swelling of the part makes the ligature much too tight, producing in consequence an irritation, which sometimes brings on suppuration, which bursts up the wound.

But when after a short delay, which allows the bleeding to stop, the parts which are in some degree already swollen, are brought accurately together, I have always found the operation succeed better, and without deformity.

When a great part of the lip is taken away, and when the surfaces meet with difficulty, there is a straining on the pins, and a consequent fretting of the wound. This is another cause of failure. It may be often prevented, by carrying an adhesive strap from cheek to cheek, and bringing it over

the lip betwixt the pins, or perhaps nearer the chin, so as to support the pins, but chiefly to act as a monitor, and to check the unwary motion of the lips.

The wound should be kept dry, and if possible without motion, that a scab may be formed. If a little matter should form, we are not to throw the parts loose, but let it out, with the point of a fine needle, and still retain the parts in contact.

On the fourth day, I take out the lowermost pin, (allowing the threads to remain if they will,) first carefully washing the pin with a camels-hair pencil, and clearing it of the adhering hard mucus or blood. When the pin is withdrawn, without the point being previously cleaned, it comes through with pain and difficulty, and may even tear the new adhesions. After a slight suppuration has loosened the pins, they should not be allowed to remain, for they are in danger of deforming the lip.

There occur incysted tumours of the fleshy part of the lip, which nothing but the knife will remove. I have taken them out by dissection, rather than as the cancerous lip is cut. Stretching the lip over the finger of an assistant, and exposing its inner surface, we can dissect out the tumour, without cutting its sac; and here, as well as in accidental cuts of the lip, the edges may be brought together by ligature.

OF THE HARELIP.

Children are born with a cleft and deficiency of the lip, and sometimes the bones of the upper jaw partake of the defect. The lip has sometimes a simple fissure, or there may be a double fissure, with an intervening small lobe. The case is the more unfavorable the more space which is left; and the worst cases are those in which the fissure extends into the bony palate, and leaves a communication betwixt the mouth and nose.

On observing the face of an infant with this kind of malformation, I have noticed the deformity to proceed as much from the breadth of the face as from the deficiency in the lip and palate. On examining the parts on dissection, I have seen the chasm in the palate to be more owing to a separation of the upper maxillary bones, than to the defect of the palatine plate. I am therefore led to advise that due attention may be paid to the reduction of the bones, and I think in many instances it will be of essential service to press the cheek-bones together, this may be done by a spring adapted to the back of the neck with pads to press upon the cheek.

It sometimes happens in this kind of deformity, that a piece of the jaw stands forward and out of its place, in which case it is to be violently broken down and pushed into its place. If it be necessary to cut the bone for this purpose, yet it will not be necessary to use a saw, and certainly not be re-

quired to cut the soft parts which surround the bone. It is very wrong to follow the recommendation of cutting off the projecting bone with forceps, for I affirm it is only out of place, and not superfluous. As to the operation upon the lip, the difficulty is in adapting the incisions to the shape of the fissure.

If the fissure is double, it may be necessary to see the operation completed on one side before we do it on the other. If a lobe intervenes, it may be advisable to take it entirely away, or more likely it may be practicable to cut it into a triangular form and to adapt the edges of the fissure to the sides of the triangle.

The patient's head rests on the assistant's breast. The surgeon separates the lip from the gum, if it be necessary; then takes hold of the lip, of one side, with the harelip-forceps, leaving out from under their edge, what he means to cut off, and with one motion of the scalpel he cuts this portion off. Then moving his forceps to the other side, he places it so, that he may pare off the edge of that also, and bring the termination of the cut accurately up, so as to form an angle with the first.

The disadvantage of the harelip-forceps is, that they do not take a firm hold of the lip. They grasp unequally, and when the incision is but half performed, the lip is apt to slip from them. Sometimes the dryness of the lip in the first cut, gives a firm hold, while in the second, the forceps or lip, being bloody, they slip.

Preferable to this manner of operating is that recommended for the cancerous lip. If the operation is to be done in that way, we have first to separate the lip from the gum, then to introduce the piece of flat stick betwixt the lip and gum, and against that the incisions may be made with great nicety.

The pins are introduced as in the instance of cancerous lip, and the precautions are of course the same.

Adhesive straps, or the bandage of M. Louis, must come in aid of the twisted suture, in these operations on the lips. The bandage of M. Louis is a double-headed roller, the centre of which is put upon the forehead, the ends crossed on the neck, then brought forward on the cheeks, where they support two pads, which being pushed forward by the operation of the bandage, sustain the lip. One end of the bandage is then split (with some regard to the place of the pins), the other is passed through it, and drawn like the uniting bandage. By touching the pads and the extremities of the rollers with adhesive plaster, they may be made very neat and firm, so as to be an effectual check on the motion of the lip.

OPERATION FOR IMPERFORATE ANUS.

Children are sometimes born with the anus closed. They are also born without a rectum, or with the rectum terminating in the bladder of urine, or the vagina, or in a cul de sac.

I have dissected such children, where the intestine ended in the bladder, also where it ended in a large pouch or bag. The subject is important, and I think the operations which are recommended for the removal of this fatal malformation are but ill calculated for their object. I have attempted to form a passage for the fæces, and have not succeeded; and after revolving the subject much in my mind, I offer my reader the following observations :—

When the anus is distinctly marked, and where it is only closed with a membrane, it will be practicable to open it with the lancet, and to retain it open by the use of tents or the bougie.

When the anus is not only closed, but when the rectum is wanting, and not even a mark of the anus is visible, we are recommended to pass a trochar into the place where the anus should be, and carefully following the course of the sacrum, search for the intestine. I performed an operation of this nature. I opened the place of the anus, but finding no fæces, I introduced a small flat trochar, and remembering the course of the rectum, I pushed the instrument as far as the promontory of the sacrum, taking care to avoid the bladder. Finding no discharge I introduced a tent, with the hope that, lying near the distended gut, it might make an opening by ulceration. I failed, having indeed very little hope from such an attempt.

A surgeon of Brest executed an operation more likely to give relief. He opened the belly above the left groin, brought out the segmoid flexure of

the colon, opened it and discharged the superabundance of flatus and meconium, and fixing the intestine to the wound, made an anus at the groin: the child lived.

Callisen, of Copenhagen, has proposed to do the operation by making the anus in the loins. He failed in his operation.

It appears to me possible to do an operation, that will relieve the distended intestines; and if finally successful, will not entail a miserable existence on the patient, if he survive. I make the following proposal with much hesitation, well aware of the difficulty attending it:—

Make an incision into the left iliac region, introduce the finger, and search for the distended intestine, the cul de sac or the connection of the gut with the bladder: having brought out the intestine, puncture it, and relieve the bowels of their load: put a ligature to the intestine, that it may not slip or be lost; introduce the finger into the wound, and push the point of the finger behind the bladder, and down to the perineum; pass a strong probe upon the finger, cut on the extremity of the probe, so that it appears at the anus; draw the ligature which is about the intestine through the eye of the probe, and bring the gut down to the anus. If this should be accomplished, the parents may pray for the life of their child; but with an anus at the back or the groin, they ought not to wish its life prolonged. The only difficulty in this operation will be, to find the extremity of the gut, the danger is from the

abdominal inflammation ; but there are difficulties which must occur in the operation, for making an anus at the groin, and we have seen that they have been overcome.

IMPERFORATE VAGINA.

Female infants are sometimes born with an imperfection, which, though not so fatal as the obstruction of the intestine, entails great distress on them at a later period of life. I allude to the vagina being closed by the hymen, or imperfect and obliterated at its lower part. When this imperfection is produced by the unnatural extent and strength of the membrane, called hymen, if it does not reach altogether across the passage, the obstruction will be discovered in due time ; yet I ought here to notice, that a necessity has occured during labour, of cutting the hymen to permit the delivery of the child. The absolute necessity for an operation occurs, when the membrane is extended quite across, and is imperforate. Often, the defect is not discovered till the time when the menstrual blood ought to be discharged ; then it occasions great distress, and that distress returns with aggravation on each recurrence of the menstrual period, until the falling of the belly, the tumour in the vagina, and the bearing-down pain, with the attendance of all those sympathies which arise from disorder in the womb, make an examination necessary. The vagina is now found to be distended, and the membrane tense and dank.

with the blood accumulated behind it. The operation to be performed is simple,—the obstructing membrane is to be divided by a crucial incision.

If, however, as sometimes is the case, the obstruction proceeds from a defect of the vagina, or the adhesion of its sides, the operation is one of great difficulty and danger. It is recorded that the operator has cut into the bladder, and it is evident that there is equal danger of cutting into the rectum. This makes it necessary to recollect the relative situation of parts, and especially the curve which the vagina takes, inclining to the axis of the pelvis. Before the operation be attempted, the accumulation in the vagina should be great, and the case urgent. This will diminish the chance of failure by cutting into the bladder, or into the rectum. The dissection (for such it must be) is to be cautiously prosecuted, until the accumulated fluid have vent.

SECTION IV.

OF LITHOTOMY.

THE best lithotomists whom I have seen operate, have gone to work with anxious feelings. Cheselden confessed that he suffered an anxiety even to sickness, before operating, and until the immediate call upon his resolution and firmness banished all thought of the precarious nature of the operation, and the anticipation of the infinite variety of ways in which discomfiture overtakes the surgeon. For my own part, I have seen many good surgeons operate; but those who have been the most confident, and boasted the most of their uniform good success, have generally failed in some essential circumstance, when I had the opportunity of attending their operation.

Lithotomy is unquestionably the most difficult, and were I to judge by what I have seen, the most precarious operation of the whole circle of domestic surgery.

Yet this opinion of the precariousness of lithotomy is founded rather on the many errors that I have seen committed, than on a conviction that unto-

ward circumstances are unavoidable in this operation. Nay, on the contrary, I deceive myself if I have not been able to trace such errors to their source; and I hope to point out how they are to be avoided.

There is no end to what are called improvements in this operation: every surgeon who operates once or twice contrives a new method. But if they would read diligently the history of lithotomy, they would find that so much has been done already, that there is no room for improvement. They would at least avoid the folly of bringing forward, as new inventions, instruments which have been tried and long since thrown aside.

Soon after I became a surgeon, fearful of the mechanical apparatus of the grooved staff and gorget, and of the evils I had seen result from it, I preferred operating with a knife. Fear absolutely induced me, in a public operation in the Edinburgh hospital, to lay aside these improved instruments. I doubt not that others attributed to a desire of singularity, that which arose merely from the consciousness that, as I had often dissected the parts for the demonstration of what should be cut in the operation of lithotomy, I could with the same instrument which I had been accustomed to use, cut the parts which lithotomists had determined should be cut; whereas, if I took the gorget, my experience of the form, the firmness, and the relation of the parts, could have been of no manner of use to me. I must have proceeded by the mechanical adaptation of instruments in which

a knowledge of anatomy was of little service, and by which I should have been subjected to the same accidents which I had witnessed on former occasions.

It is decidedly my opinion, that the knife is the instrument for cutting into the bladder; and if I conceived that the young surgeon were to be guided by my opinion, contrary to that generally adopted, I should have a very short lesson to give here; namely, the manner of cutting with the knife. But I am writing a systematic work, in which I am bound to consider the common opinion, and the most frequent practice; bound to give my private opinion in honesty, but not allowed to reject that practice which has obtained the most general suffrage.

I have, therefore, to describe the operation with the gorget; to point out the mistakes commonly committed, and how these errors are to be avoided. I shall then describe how the knife is to be used, when the gorget is laid aside, as I hope it soon will be altogether.

OF THE SYMPTOMS OF THE STONE IN THE BLADDER.

The symptoms of stone in the urinary bladder are these—

1. Pain in making water. The pain in passing the urine is greatest in forcing out the last drops of urine, because by the contraction of the bladder, the stone is brought to the neck, and in contact with the most sensible part of the bladder.

2. Often there is a dull pain in the region of the bladder, with an acute and insufferable pain in the glans. The pain is greatly increased after exercise, or the shaking of a carriage. We see the patients coming to an hospital in the greatest torment, from the rough stone jolting in the bladder*, and then we may see the poor creature trying to stand on his head, in order to move the stone from the irritable neck of the bladder.

3. Bloody urine. This is in consequence of exercise or jolting, and proceeds from the rough stone injuring the surface of the bladder.

4. Difficulty in retaining the urine. This dribbling of the urine from the bladder is produced by the irritability and painful state of the bladder; which is attended with relaxation of the sphincter and muscles of the urethra.

5. Very frequently when the urine is flowing in full stream, it stops suddenly, without a cessation of the stimulus to evacuation. This arises from the stone falling upon the orifice of the urethra; or rather it happens in this way. When the bladder is full, and distended towards the rectum as well as towards its fundus, the stone rests upon the rectum; but as the bladder is emptied this lower part contracts, and lifts the stone to a higher level and brings it opposite to the beginning of the urethra. If the patient be placed upon his hands and knees, while making water, and this sudden

* In which case, it would be consummate cruelty to examine the patient. Let him have the warm bath, and an opiate, and be put to bed.

stoppage occurs, it is a particularly strong indication of stone in the bladder, especially if the urine flows on changing to the more recumbent posture. Yet this may be produced by a pendulous tumour in the neck of the bladder, arising from the prostate gland.

6. A sense of weight and fulness in the rectum, the piles, or the falling down of the gut, often accompany this disease. But they also accompany every disease in the neck of the bladder.

7. Mucous sediment from the urine is another effect of stone in the bladder. This proceeds from the surface of the bladder and the prostate gland, excited by the presence. This, however, may proceed also from inflammation in the inner coat of the bladder, or from stone or matter formed in the kidney.

OF SOUNDING AND FEELING THE STONE.

The presence of a calculus in the bladder is to be ascertained by the operation of sounding. The sound is an iron instrument nearly of the form of a catheter, but solid, the better to convey the vibration to the hand.

The sensation conveyed by the sound, when introduced into the bladder, and when it strikes or rubs on a stone, though not to be described, is yet sufficiently distinct, and not liable to be mistaken. There are, however, circumstances which may lead to a very erroneous conclusion. The surgeon ought to have sounds of different forms, not only

adapted to the age, but also with a view to reach the different parts of the bladder. Then a large instrument with a full curve, and a prolonged point will sometimes touch the stone : when the stone is in a different position, a short and straight sound will touch it more readily.

The sound is introduced into the bladder with the precautions recommended under the head of operation of the catheter. When in this case the sound is introduced, the *rub* is conveyed to the hand, and the sensation, as if of a stone in the bladder, is felt.

When the staff, A, is introduced into the bladder, it may happen that the stone, B, lodges under the level of the urethra, and of the course of the sound; consequently we have to force or strike down the convex part of the sound. This lodgement of

the stone under the level of the sound, I have ascertained by dissection as well as by experience in sounding.

In this slight sketch it is seen how the finger introduced into the rectum may come to the aid of the sound, and by pressing up the lower part of the bladder ascertain the presence of the stone, and even inform the surgeon of the size of the stone. To ascertain the size of the stone, I conceive to be a very necessary duty, though too frequently neglected.

It may happen that the stone is lodged to one side, dropping as it were by the side of the rectum; when, the sound must be pressed laterally and downward, to strike upon it.

In sounding, the surgeon will find advantage in changing the position of the patient, so that the stone may shift its place.

The enlarged prostate gland sometimes throws up the catheter, so that the stone can not be felt. The stone in this case lodges behind the prostate; but by introducing the finger into the rectum, it is possible to push the point beyond the gland, and so raise the lower part of the bladder, as to push the stone within the rub of the sound.

It will be practicable to use a gum catheter, of such a curve as will both accommodate itself to the urethra, and reach the stone behind the prostate gland. But an operation ought not to be undertaken, with so slight an assurance as the gum catheter can give us.

When there is a lodgement of the stone in a particular part of the bladder, or when at any time there is difficulty in ascertaining the presence of the stone, it is better to use the silver catheter, which, though it do not convey the vibration equally with the steel sound, will yet answer this purpose sufficiently ; while it has this advantage, that you introduce it with a full bladder, and feel in all possible directions, and with every variety of posture of the patient. On letting the urine run through the catheter (while it is still held,) if a stone be in the bladder, the contraction will bring the stone in contact with the instrument.

THE OPERATION.

I do not imagine that the irritation from the stone is unfavorable to the operation of lithotomy ; but it need scarcely be said, that all inflammation must have subsided before the operation be attempted. If there are pains in the kidneys and loins, the operation must be delayed, as new stones may be descending.

Before the operation is performed, the patient ought to be reduced below the robust and vigorous standard, by living on light and sparing diet, and by the use of mild laxatives. But if the patient has been reduced and irritated by a journey, he must be recruited by repose and light nourishment.

INSTRUMENTS, &c.

The staff, of the size and form with the sound which you have previously used—A scalpel—The gorget—A straight probe-pointed bistory (lest it should be necessary to enlarge the cut into the bladder)—Forceps of various sizes, some curved (and let care be taken that they be well tempered, since I have seen them bent and twisted in the operation)—A scoop for the sand, which may be abraded from the surface of the stone—Sponges and tenaculum—Garters to tie the patient—An injection-bag and pipe, or large syringe, to wash out the bladder, when the stone is lying among firm coagula, preventing the chuck of the forceps against it, or to cleanse the bladder of the broken pieces of stone. —I would recommend also a searcher, made in this form, to ascertain the position of the stone, and to bring it forward if it lie in a sac or depression of the bladder.

Let the surgeon be sure of the adaptation of the beak of the gorget to the groove of the staff. The gorget, I think, should be of a shape to announce its full entrance into the bladder; that is, a little behind the cutting edge, it should be narrowed, and particular care should be taken that the cutting edge, where it is near the button, or probe-beak of the gorget, do not stand too abruptly off, and that it be extremely sharp at that place. If it be blunt, and abrupt to the beak, it will cut the urethra with difficulty, and may push the prostate gland before it. That this is possible I have demonstrated on the dead body, by running a blunt gorget in its whole course on the staff, and yet the bladder has not been opened.

If the surgeon has done as he ought, in informing himself of the size of the stone, there will be no occasion for instruments for breaking the stone. I much doubt the propriety of using them.

Let the perineum be shaved, and the rectum emptied by an enema. The terror of the patient, and the irritation of the bladder, may prevent the bladder from being distended with water; yet I consider a few ounces of urine in the bladder as so absolutely essential, that we should ensure it even by tying a soft tape round the penis, when necessary.

POSITION OF THE PATIENT.

The patient is seated on the edge of a strong table; a pillow is under him; then laying him down

upon the table, the shoulders and head are supported. The staff with a groove upon the lower convex part, is now introduced*: and then the feet and hands are tied together, by putting a noose of tape over the wrist, making the patient grasp the sole of the foot; and then tying the ligature around the hand and foot.

The breech now presented over the table, the surgeon seats himself at a convenient height; and taking the handle of the staff, presses it a little towards the right groin, so that the convexity of the staff is felt in the perineum. The staff is now given to the assistant, who holds it firm in the position in which he receives it, having the thumb of the left hand over the head of the staff, and the scrotum supported by the right hand.

In regard to the staff, there is one thing more, particularly to be attended to, viz. that by the assistant's carelessness the point of it be not brought out of the bladder, and made to rest in the neck of the bladder. Be sure, then, that by elevating the handle of the instrument, you can push it smoothly onward in the bladder.

If you were to cut, while the point of the staff rested in the neck of the bladder, instead of being

* If the sound, without a groove to direct the hand, should be introduced, as I have seen, the consequence is terrible if the surgeon cannot operate with the knife. For when once the urethra is laid open in search of the groove, and none found the sound cannot be withdrawn, and the staff introduced. It is at least more apt to pass out by the cut into the urethra than into the bladder.

fairly within the bladder, when you were about to thrust the gorget forward, it would pass not into the bladder, but betwixt the bladder and rectum!

It may also happen by the inattention of the assistant, and by his depressing his hand too much upon the belly of the patient, that the end of the staff starts out of the urethra, the moment you have made the incision into it! It will be very difficult to get the staff into the right direction so as to pass it home into the bladder. The surgeon will be in the most lamentable state, if he is not able to introduce the common directory, and complete the operation with the knife.

FIRST PART OF THE OPERATION, CUTTING INTO THE PERINEUM.

We are directed to begin our incision on the prominence of the staff, and cutting through the skin and integuments, to carry it down between the verge of the anus and the ischium, or somewhat below the ischium.

But this does not correspond with my idea of the proper incision. In the first place, I do not approve of the staff being held so far to the left side of the perineum, nor of its being made to bulge out so much. I let it remain in its unconstrained position; then making it be held firm, cut down to it, making an incision towards the forepart of the prostate gland, not as if searching for the staff.

This cutting for the staff, and having no other

object than to prepare for the beak of the gorget entering the groove of the staff, is the conception of the merest tyro. Our object, in the first instance, is to lay the perineum open, in sufficient extent for the extraction of the stone, and to unbridle and cut across the muscles and fascia which support the perineum.

1. The surgeon feels the prominence of the ischium, observes the rapha and prominence of the staff; he strikes the knife into the space betwixt the crus penis of the left side, and the bulb of the urethra. From this, with a deep, steady incision, it is carried down directly betwixt the anus and tuberosity of the ischium, and the incision terminates opposite to the lowest part of the margin of the anus.

2. Now, we are told that a small incision of the skin impedes and embarrasses the surgeon in the extraction of the stone. But this first cut cannot do effectually what is required in the *first incision*, as it is termed, which means the first part of the operation. The accuracy of this outward cut is of importance only as it naturally leads to the full separation of the muscles, which are truly the cause of any embarrassment, the skin always yielding sufficiently. However, the skin must be cut low for another reason.

One or two successive strokes of the knife deepen the wound, and the surgeon must be careful that he carries the knife from the side of the staff down by the side of the rectum, and that he cuts through the transversalis perinei muscle, and the ligamentous

connections of the urethra in the perineum*. By experience, as well as by observing, the difficulties of surgeons, in circumstances where I could not interfere, I well know that the forceps are checked when the transverse muscle and fascia are not cut through, the forceps pass over this strong fasciculous of muscular fibres and ligaments, which afterwards, in extraction of the stone, bind up the instrument, and forcing it against the arch of the pubis, the stone is thereby thrown off the grasp of the forceps. There are few lithotomists who have not experienced this: they call it the slipping of the stone. They seize the stone again and again, with increasing violence and desperation.

In cutting through the muscles of the perineum, the operator must carry the finger of the left hand into the lower part of the wound, and press down the rectum, else it may be wounded†. He must continue his incision until he feels the prostate gland, and that there is no stricture on the wound below, from the crossing of the flesh.

SECOND PART OF THE OPERATION, CUTTING THE URETHRA.

If the staff has been kept hitherto nearly in the middle, it must be now inclined with the handle to the right groin; so that the convexity of the instrument may appear bulging in the wound of the

* See engraving of morbid parts, preserved in my collection. Folio.

† When the rectum is cut, it generally heals; but sometimes the wound degenerates into a fistula. Though it is easily cured, it is truly a fistula in ano.

perineum. And now the surgeon inserting the knife deep in the wound, turns up the edge of the knife, and cuts freely and decidedly into the groove of the staff*. He keeps the nail of the fore-finger of the left hand in the groove of the staff, until he takes the gorget from the pocket of his apron, or the ready hand of the assistant, and fixes the beak into it.

THIRD PART OF THE OPERATION, OF THE GORGET.

Directed by the finger of the left hand, the blunt point or beak of the gorget is introduced into the groove of the staff. It is moved backward and forward, and made to grate upon the rough groove.†

Now, the surgeon rising from his seat, and secure of being in the groove of the staff, carries the gorget onward, recollecting the curve of the staff, and that he has to carry the gorget in the axis of the

* I am satisfied, that of ten operators whom I have seen operate, nine have cut into the the bulb of the urethra. There is no great harm in this ; only, that when not aware of it, they make too small a cut into the urethra ; they find the beak of the gorget does not enter upon the staff ; they cut a second time, and again, and then the young surgeon, perhaps thinking too much of what others are thinking of him, becomes ashamed of his awkwardness, and makes at last a desperate plunge with the gorget, imperfectly fixed in the groove. The effect is terrible ; for the gorget does not enter the bladder. Whoever has doubts of his finger being fairly in the groove of the staff, let him slit up the urethra freely ; the only bad effect is the escape of a considerable portion of the urine.

† There ought to be a slight roughness in the groove, or the polish ought not to be given to it ; for I have found that the very high polish makes us less easily distinguish the staff from the surrounding parts.

pelvis, not directly onward. He moves slowly at first, until he sees the urine trickling over his instrument, when he carries it more resolutely onward, lest the urine escape altogether from the bladder. The gush of urine announces the completion of this incision.

DANGERS IN THIS INCISION.

I HAVE twice seen the gorget driven between the bladder and rectum. On the dissection of one of these cases, I saw no wound nor sinus between the bladder and rectum. This, for the time, puzzled me, until frequent operations on the dead body, gave me examples of what had occurred. The gorget had not gone off the groove: it had only not cut the neck of the bladder, it had pushed the prostate gland onward upon the staff, and had not pierced the neck of the bladder, nor the prostate gland. This, with bad instruments, and in the relaxed state of the parts in the lessons on the dead body, is particularly apt to happen. To guard against it, the cutting edge of the gorget, near the point, must be extremely sharp, and very oblique. The edge pentrating in any degree, ensures the complete incision.*

* The gorget ought to be of that breadth in the sharp edge, that it may cut through the left side of the prostate gland. If the substance of the prostate gland and the fascia of the perineum be completely cut, the wound of the bladder will enlarge to transmit the largest stone. But if the base of the gland be not entirely cut through, there will be a bridling and stricture on the forceps. As the gorget is uniformly of one size, (and, indeed, cannot be made broader without endangering the

The usual manner of proceeding, is to withdraw the staff almost instantly, and as if finishing the manœuvre of the gorget. But if any one look to a contracted bladder, and then to the sharp gorget, he will see that there is a danger of the bladder being cut upon the gorget, if the instrument be left in the bladder until the forceps be introduced. I think that the gorget should either be immediately withdrawn, or the staff left as a guard upon the edge of the gorget; or the gorget withdrawn, and the staff left.

Though I acknowledge that it is contrary to the advice of some celebrated surgeons, I would advise the gorget to be withdrawn. The forceps can, without a directory, be introduced at first, as they too often, are many succeeding times introduced in operations where some circumstances prevent the immediate extraction of the stone. If the incision be well performed, nothing will prevent the introduction of the forceps; and I conceive the staff to be a better directory than the gorget, if any directory were required.

Further, I think it the duty of the operator to pass the fore-finger into the wound of the bladder, and to examine the wound, before he passes the forceps, and begins to grope and plunge for the stone. It has happened, that the bladder has been brought away with the stone! I can believe

cutting of the pudic artery), it has the fault of not entirely cutting through the prostate gland and neck of the bladder. In operating with the knife, in place of the gorget, the incision can be adapted to circumstances.

this, because I have seen it nearly happen. I have a bladder of a child, where I saw the operator pull with all his force: he did not succeed. On dissection, I found the stone in the bladder, and the bladder uncut! He had grasped the stone with the forceps, but the bladder was betwixt the stone and the instrument. Such terrible mistakes as this, come of passing the forceps along the groove of the gorget, as soon as that instrument is driven home.

If by cutting too small a part of the bladder, the forceps cannot be easily introduced, when the gorget has been withdrawn, then we have the blunt gorget, which being put into the bladder, will, at all events, carry on the forceps without the danger which may arise from the sharp gorget remaining in the bladder, at a time when the muscular coat suffers such extreme excitement, and must, of consequence, be strongly contracted.

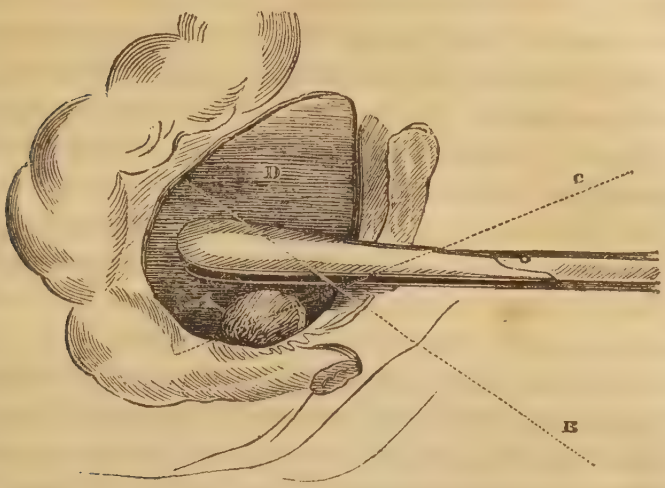
In withdrawing the gorget, it should be pressed towards the right side of the perineum, that the edge may not make a second incision.

OF THE FORCEPS.

When the forceps are introduced, the surgeon should not immediately begin, with both hands, to separate the handles of the instruments, and to dive and chuck for the stone; but endeavour to feel for the stone with the forceps closed, and ascertain its exact position before he attempts to seize it.

When the surgeon is grasping for the stone, and cannot even make the stone sound till he has

overshot it in the manner here represented, he must raise his hands, and point the instrument downwards into the lower part of the pelvis. Now,



A, *the stone.* B, *direction of the forceps overshooting the stone.* C, *necessary direction to seize the stone.* D, *the bladder.*

perhaps, he touches the stone, and still cannot grasp it. A very little knowledge of the parts, and experience of the difficulties of the operation, inform even a spectator of what is going forward. Witnessing this difficulty, with most distressing feelings, I have seen an operation continue for an hour, when, by putting the finger into the rectum, and raising the lower part of the bladder, all difficulty of grasping the stone would have vanished.

When the operator cannot with ease and perfect certainty introduce the forceps either at first, or in the second or third attempt, he ought to use the

blunt gorget, and be sure that he touches the stone with the forceps, without any intervening substance: for it has happened, that the operator has sometimes pushed the side of the bladder before his instrument, and along with the stone seized the side of the bladder betwixt the teeth of the forceps.

We not unfrequently see a surgeon pressing the forceps deep into the right sinus, and hitting upon the stone, then it escapes into the left side; he follows it there, and thus trifles in ineffectual yet painful endeavours. This notion of sinuses of the bladder, by the sides of the rectum, is a mere deception. There are no such cavities. When the surgeon turns the handles of the forceps to the right side, and the blades, of course, deep into the left side of the pelvis, and then again into the other side, in the same manner, he is not moving the instrument in the relaxed bladder; but the bladder is contracted about the stone; it is moveable in its place: it is carried upon the end of the forceps!

This I have ascertained. After seeing this changing for some time, I have put my finger into the bladder and found it closed (but soft and wrinkled) about the stone, and accurately adapted to the form of the stone. To seize the stone in this situation, it is only necessary to extend the blades of the forceps, which, stretching the bladder, the stone comes to occupy the space betwixt the blades; and, on closing them gently, the stone will be found there. If this stretching of the bladder in one direction does not succeed, it will in another direction.

I would observe further, that the forceps are ill fitted for ascertaining the exact situation of the stone. When there is any difficulty, it is better to take such a sound as I have represented, and put it into the wound, then we can touch the stone, and, if necessary, raise it from its cavity, if such there should be, and bring it forward.

Coagula of blood will often confound the operator;—for the blood has run backwards into the bladder, and, filling, it surrounds the stone, so that the forceps close upon a soft mass. In these circumstances, withdrawing the forceps, we wash out the bladder with the syringe and tepid water.

But sometimes it happens, from the transverse muscle, or levator muscle, not being sufficiently cut in the external incision, or from the gorget not having cut through the prostate gland and the firmer fibres, which form its sphincter, that the stone cannot be extracted. The violence used is great. The cries of the patient bear testimony of that violence.

In this case, the surgeon should introduce his finger into the wound, and feeling that either in the lower part of the wound there is a firm bracing of the flesh, or that the incision of the bladder has a stricture, as it were, which does not yield and dilate, the incision must be enlarged. If the stricture be in the muscles of the perineum, the scalpel must be used to cut across the fibres, while the rectum is pressed down with the fore-finger of the other hand. If the tightness be in the bladder, the probe-pointed bistory is to be introduced, so as to

enlarge the incision of the neck of the bladder laterally.

When the stone is firmly held in the forceps, it is then to be slowly extracted. We cannot fail to observe that it is impossible to stretch the wound upward, for there is the arch of the os pubis; and again and again I have seen it happen, that the surgeon not aware of this, and pulling directly outward, the stone projecting above the blades of the instrument, strikes against the bone of the pubis, and is pushed off into the bladder. And if the stone is very firmly held in the grasp of the forceps, the urethra is very apt to be torn.

The handles of the forceps are, therefore, when this difficulty occurs, to be depressed by the side of the anus, or upon the gut. There the parts yield, if they have been properly cut.

If, having a firm hold of the stone, we find that it does not come easily through, we pass a finger along the blades, to examine whether the length of the stone is not across the blades of the forceps. If it should be so, by holding the stone less firmly in the grasp of the forceps, and pushing one end of the stone, with the point of the finger it may be brought into the more favourable direction for extraction.

When the stone is large, and the incision has been made as large as has been safe, and yet it is retained by the forceps with difficulty, I have again and again freed the patient from the continued pain of ineffectual efforts, by introducing my two fingers into the rectum, raising the stone, that the forceps

might have a good hold of it, and then assisting the forceps in extracting it, by pushing the stone forwards through the incision; and when the forceps have slipt here, still the stone did not fall into the bladder: It was already in the passage, and I held it there. I have seen a patient, in a public hospital, destroyed by the long continued exertions of the surgeons, merely because they were not aware how manageable the stone is with the fore and middle finger of the left hand in the rectum.

When the stone is large, the forceps (though they do in a wedge-form make way for the stone) are not to be pulled directly outward, but to be used as the accoucheur does his forceps, by movement from side to side. Bringing down one blade, it is to be retained in its position, and then by a sweep of the handles the other is to be brought down until the parts dilating the stone is extracted.

If the stone be brought out rough on all sides, it grounds a *presumption* that there is no other stone; but it is no *proof*, and we should feel again in the bladder. If there is one side of the stone smooth, and the other rough, it founds a strong presumption that there are other stones. We must recollect that it is most dangerous to leave a stone in the bladder after the operation of lithotomy; for the inflammation produced by the incision is increased by the continued irritation of the stone, and will destroy the patient; whereas, if relieved from the irritation of the stone, the parts suffering from the operation only, the recovery is more certain.

If the stone is broken, we apply the parts together and see that we have got them all; and when the softer surface has broken down under the forceps, we must be careful to wash the pieces away with the syringe, or bag and pipe, by injecting several times into the bladder; and, with the finger, examining that no considerable portion remains.

I possess several specimens of stones engaged in sacs of the bladder; still I may say, as I have done in a former edition, it is a rare occurrence. I have often heard whispers during an operation of sacculated stones, but it always proved to be a difficulty arising from a bad incision. These sacculated stones must give very little inconvenience, and not call for operation.

That stones may adhere, I know; but this is the nature of that adhesion. Mr. Lynn, in performing this operation, laid hold of the stone, and brought it down with some difficulty; but, with great uneasiness, he found that he had inverted the bladder, and that the stone adhered to it. He turned off the stone from the granulation on the inner coat of the bladder, as the stone of a ripe peach is turned out of the pulp, and reduced the bladder. He carried the stone to Mr. Hunter, as a proof against his opinion, that living parts could not attach themselves to inanimate matter. Mr. Hunter gave it as his opinion, and convinced him that this was a stone formed on the fungus excrescences of the bladder, and, in consequence of the disease, not a stone adhering to the bladder.

Sir Everard Home is of opinion that stones adhere by means of coagulable lymph. I have a very fine preparation establishing the truth of this opinion.

TREATMENT OF THE PATIENT AFTER THE OPERATION.

Oiled lint is put upon the lips of the wound, the thighs are bound slightly together with a soft tape, and the patient is carried to bed. Under him the clothes are placed as for a woman after child-bed. An opiate is usually given.

The urine is, for the first fortnight, passed through the wound. Often, however, on the second and third day, it is passed by the urethra. This is merely owing to the tumefaction of the rising inflammation, and of course temporary. Towards the end of the fortnight, the urine should pass by the urethra, and in a perfectly successful operation, the parts should be healed in three weeks. The dressing is very simple, all our care being to dress mildly and to see that no lodgement of urine or matter be allowed by the side of the rectum.

The violence of the operation, without hæmorrhagy or inflammation, I have seen kill the patient in about ten hours. The continued pain and violence of the operation is in this case too much for the nervous system to bear, and the powers of life are destroyed before they are assaulted through the vascular system.

The first rising of high inflammation is a period of danger to life. When the system is suffering directly under the pain and violence of the operation, there is an incessant vomitting or hiccup. The warm bath, with large opiate clysters, I conceive to be our chief resource. Though I know that when the bowels can be moved in that low irritability of the stomach, it relieves this most alarming symptom.

When the inflammation does actually attack in an alarming degree, we must be resolute in bleeding repeatedly. We blister the belly largely, use the warm bath, gently move the bowels, and throw anodyne clysters.

HÆMORRHAGY.

We ought to turn our attention to the quantity of coagulated blood which lies under the table before dressing the patient. The question that naturally occurs is this, whether is the quantity of blood such as to indicate the cutting of a main artery? and the loss so great, that in the event of a return of the hæmorrhagy, the patient's life or health may be in danger?

The blood must flow either from the *transversalis perinei*, or from the *artery of the bulb*, or from the trunk of these the *internal pudic*. The first of these is always cut; the second too often needlessly, and yet it is not easy assuredly to avoid it; the last is often cut, and the patient sometimes

dies. It is the most inexcusable cause of failure when the patient dies of bleeding.

The artery of the bulb is a large artery, it need not be cut if we make the course of the incision towards the fore-part of the prostate gland, and do not cut as if it was our avowed intention to cut the bulb, which, however, I have ventured to say, is the part most generally cut, in all its length. The artery goes twisting under the ramus of the os pubis, and dives deep into the bulb of the urethra. Sometimes it passes across so low that it must be in the course of the incision. I think I have seen this artery cut in a boy, and cause fatal hæmorrhagy.

It is, however, most necessary of all to observe the trunk of the internal pudic artery is wounded. It may be done either by the knife in the first incision, or by the gorget.

When the surgeon is fearful of wounding the rectum, and keeps too near the tuberosity of the os ischii, or when he mistakes the feeling of the protuberant part of the bone for the inner margin, and does not calculate how much nearer the inner edge, and consequently the internal pudic artery lies to the anus, than the centre of the tuberosity is which he feels through the fat of the hip, he is in danger of cutting this artery.

To avoid the trunk of the arteries, then, we must take the anus as our direction, and keep near to it. If the finger be introduced into the anus, we shall find the gut contracted, and we may cut

close upon the coats of the gut; nay, some have kept the finger in the rectum to make this incision more securely. I have said, too, that the bulging part of the staff should not be thrust so far aside; it serves no purpose but to distort the parts, insure the surgeon's cutting into the bulb of the urethra instead of the membranous part, and making him cut nearer the bone than necessary.

In pushing in a broad gorget, unless the staff be made to yield towards the right side, so that the gorget may come more into the centre of the arch of the pubes, the trunk of the internal pudic artery is in great danger.

As in other operations, the surgeon should judge by the first jet of blood, and by the direction and size, what artery he has to deal with. If the blood springs with force from the side of the wound, and upon feeling there you find that you are nearer the bone than you imagined, let the artery be taken up by the tenaculum before proceeding.

When the operation has been tedious, all bleeding from small branches will have ceased. If the bleeding continues after the operation, it is not a trifling artery. It is not so much during the operation, or when the patient is on the table, that the danger of hæmorrhagy is great, as when it returns three hours after, or on the evening subsequent to the operation. This second hæmorrhagy, added to the loss of blood during the operation, is too much, and the patient, cold and pale after it, sinks. Sometimes a third slighter hæmorrhagy proves fatal.

If the blood flows from under the arch of the pubes, the compression or tying of the common pudic commands it. If the bleeding shall not seem to demand the needle, it is recommended, that a canula wrapt round with lint, or passed through a piece of sponge, be introduced into the wound; by pressing against the os ischii, this compress stems the bleeding from the lesser branches of the pudic, while it allows the escape of the urine.

Let me put my reader on his guard against one effect of this practice of compressing the bleeding vessels. The blood may be driven into the loose cellular membrane, and so gorge the surfaces, that a bad and extensive suppuration must follow.

If there be pain, tension and fulness in the bladder, some little time after the operation, it may be full of coagulum, which both excites the bladder and retains the urine. The finger may be gently insinuated, and then the injecting bag and pipe used to inject some tepid water into the bladder.

OF THE OPERATION AS PERFORMED IN THE WESTMINSTER HOSPITAL.

Mr. Lynn and Mr. Carlisle have of late practised the operation of Frere Cosme. I wish that gentlemen of less knowledge and ability in their profession had revived this operation. The same errors I still conceive are apt to be committed in this manner of operating, which were proved to have attended that of Frere Cosme. The opera-

tion has certainly the advantage of simplicity, and of the mechanical ways of operating; there is in this the least fear of not getting into the bladder.

A staff of the common kind is introduced into the bladder. The first incision is made in the common way; the urethra is cut in the same place, and in the same manner; but instead of the gorget, the *bistouri cache* is introduced along the groove of the staff, into the bladder.

The staff is then withdrawn. The bistory is then taken in both hands, and turned so that the edge of the knife shall present to the left side of the bladder, and the spring being so pressed, that the knife rises from the groove, in which it has lain concealed, the instrument is in that state and relation to the bladder withdrawn with one uniform continued pull.

The incision is here made into the bladder in the common direction, and it is intended to be the same extent. The operation is conducted in all other respects as the operation with the gorget.

The objections made to the operation of Frere Cosme stand in full force here; and these have been often set forth in sufficiently dreadful array. It has the advantage which was claimed by the supporters of Frere Cosme, the dexterous and the awkward, the ignorant and the anatomist, may perform it with equal security; but still with equal chance of doing mischief.

The urine is apt to escape before the incision is made. This multiplies the danger. For then the

knife being raised and spread in the bladder, and drawn thus out, it may cut up the whole side of the bladder. If the knife be raised, and the incision not immediately made, the contracting bladder must be particularly in danger of being cut upon the sharp point of the knife. If the knife be adapted to cut the prostate gland, and a very little of the neck of the bladder, on the supposition that the bladder is distended, it will cut more than sufficient if the urine has escaped, or the bladder be contracted.

Further, in the operation with the gorget, it is possible to turn the edge obliquely downward, in adapting it to the groove of the staff, so that its edge is not made to run along the bone; but with this instrument before the incision of the neck of the bladder is made, it is drawn up to the bone, and when the knife is drawn out, it must come close upon the side of the bone. It is, therefore, particularly apt to cut the internal pudic artery.

To avoid the artery in this operation, formerly they lifted the knife too little, and the consequence was, that they had to introduce it, and pull it through again and again, or if they omitted this, the forceps were thrust in with difficulty, and, of course, were grasped with firmness by the neck of the bladder.

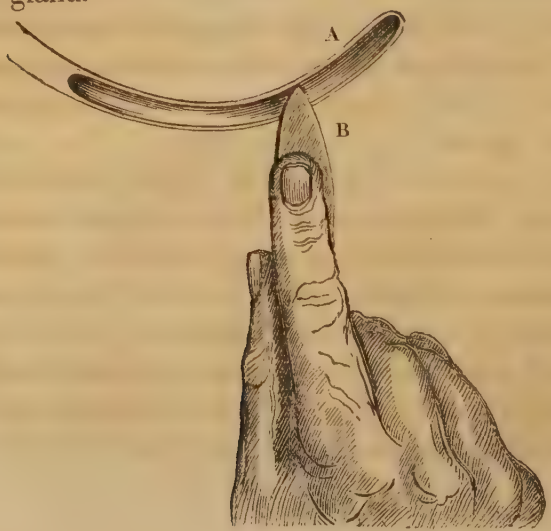
Lastly, the surgeon is in great danger of cutting the rectum by this unguarded drawing of the instrument, as happened to Frere Cosme, and those surgeons who then imitated him.

OPERATION OF LITHOTOMY WITH THE KNIFE.

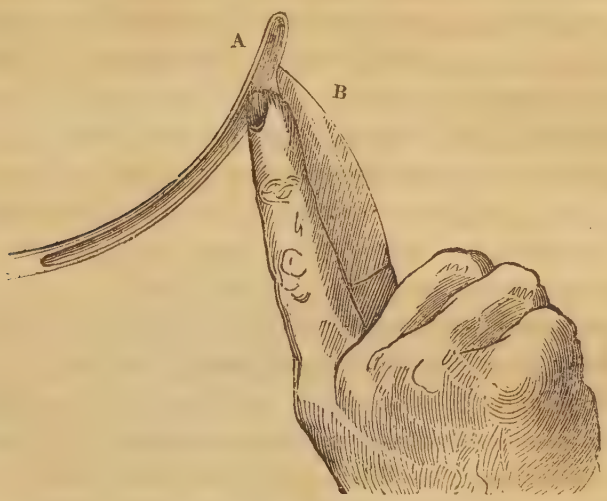
INSTRUMENTS.—A staff grooved on the right side—A scalpel, with a straight back—The common lithotomy-forceps. These three instruments are all which should be required; yet the operator would choose to have all which are occasionally necessary in the operation with the gorget.

The staff is kept in the centre, and well home into the bladder. The surgeon, making his incision under the arch of the pubes, and by the side of the anus, carries it deeper towards the face of the prostate gland; cutting near to the staff, but yet not cutting into it, and avoiding the rectum, by pressing it down with the finger.

Now, carrying the finger along the staff, the prostate gland is felt. The point of the knife is run somewhat obliquely into the urethra, and into the lateral groove of the staff, just before the prostate gland.



The knife is run on in the groove of the staff, until the urine flows. The fore-finger follows the knife, and is slipped along the back of it, until it is in the bladder; and this is the position of the knife:



Having carried the fore-finger into the bladder, it is kept there, and the knife is withdrawn; then, directed by the finger, the forceps are introduced into the bladder.

If the stone is not readily caught betwixt the blades of the forceps, the finger is passed into the anus, which lifting up the lower part of the bladder, the stone is put within the grasp of the forceps, and assisted in its exit, if it be of great size.

This I conceive to be the best way of performing lithotomy; I have done the operation in a boy in the following manner.

Having placed him in the usual position, and the staff being introduced, I put the fore and middle finger of my left hand into the anus; then striking down the staff upon the stone, I felt it with my fingers, and brought it forward towards the perineum, and to the side of the staff.

I now made my incision in the usual place; but instead of seeking for the staff, to cut into it, I cut directly on, through the left half of the prostate gland, on the face of the stone. Making thus a fair incision upon it, I thrust it through the wound, by pushing with my fingers in the rectum, as if in the action of bending my fingers. The boy was only three minutes and a few seconds on the table, and was entirely recovered in three weeks: yet this is not an operation which I would do again. The stone slipt from my grasp; and the bladder is not easily cut against a rough stone. I believe, too, though this boy never had a bad symptom, that the sphincter of the neck of the bladder ought always to be cut in the operation of lithotomy.

SECTION V.

OF HERNIA

DEFINITION.

HERNIA is a tumour of the soft parts, formed by the escape of a bowel from the natural boundaries which contain it. When I say the boundaries which contain it, I understand the walls of the abdomen, or the natural boundaries of the pelvis ; not the peritoneum ; for that membrane is carried before the protruded bowel, and forms its proper sac. I confine the term hernia to the escape of the viscera of the abdomen or pelvis, excluding the hernia cerebri, the hernia iridis, the hernia pulmonum, which are but the escape of parts through wounds ; whereas in the proper hernia there is no wound, and the bowel is covered by the sac or peritoneum, besides the common integuments.

The bowels in their natural situation are exposed to considerable pressure, and the occasional increase of this pressure is the immediate cause of hernia. The part which has prolapsed, or is protruded, suffers a less degree of general pressure than in its former seat, otherwise indeed it could not have been protruded, nor could we say with propriety that it had escaped.

Although after the hernia has come out, it lies in an inelastic membrane and cellular substance, yet this substance yields to the unremitting pressure, and the occasional exertion of the muscular walls of the original cavity. Thus there is a perpetual tendency to an increase in the quantity of the protruded bowel.

VARIETIES OF HERNIA.

Herniæ admit of distinction and of different names from the nature of their contents; for example, *enterocle*, *epiplocele*, *entero-epiplocele*. Herniæ may be distinguishable to the touch, or concealed and internal. When herniæ are distinguishable and external, the bowels come down either in consequence of the dilatation of some of the natural passages, or through a preternatural deficiency in the tendons of the abdominal muscles. The varieties of these tumours are,

I. Hernia through the spermatic passage.—This hernia comes down through the tendons of the muscles, where they split, to allow the pas-

sage of the spermatic cord; or in women to admit the passing of the round ligament of the womb.

There are six varieties:

Inguinal hernia arrested in its first stage of descent, being in the spermatic passage, but not external to the proper ring.

Inguinal hernia (bubonocele),—when the bowel just protrudes, and lodges in the groin.

Scrotal hernia (oscheocele),—when the bowel descends into the scrotum.

Hernia of the labium pudendi,—when the bowels descend through the ring in women. A hernia may be lodged here which has come down by the side of the vagina.

Hernia which, pushed out by the side of the tendon of the rectus muscle, comes more directly through the ring.

Hernia through the ring and through the spermatic process of the peritoneum; being in contact with the testicle, and CONGENITAL, or appearing at birth, or at least with the descent of the testicle.

II. Hernia under the crural ligament, viz. crural or femoral hernia (merocele).

III. Hernia through the ring for the passage of the umbilical vessels, viz. umbilical hernia (exomphalos, omphalocele).

IV. Hernia through any preternatural opening of the muscles of the belly or their tendons, have the more general term of ventral hernia.

OF CONCEALED HERNIA.

This kind of hernia is without any tumour, or external mark or possibility of distinguishing the nature of the disease by the touch. We have the following examples:

I. Hernia through preternatural holes in the diaphragm, or through the dilated passage for the œsophagus.

II. Through the hole in the membrane of the thyroid foramen for transmitting the obturator artery and nerve.

III. In women before the rectum, and through the plica semilunaris. This, however, after an unusual descent, may become hernia, with tumour in the perineum, or, in a lesser degree it may be felt by the finger in the vagina.

IV. From the openings in the back part of the pelvis, for transmitting the ischiatic nerve (ischiatocele).

In some of the older writers, we read of operations for undoing knots on the intestines, and

other internal causes of obstruction. It has even in our day been proposed to cut into the belly of a young gentleman for this laudable purpose; but the good sense and sober judgment of the consultants withstood the ingenuity of the proposer. The mind of the young surgeon is to be put to rest upon this resource of art. The idea arose from mistake and ignorance among the itinerant rupture-doctors, who shewed the ignorant spectators the intestine of a common hernia among their hands.*

These are several causes of obstinate and fatal obstruction of the intestine; but the chief are volvulus, or intus-susception, and the stricture of the intestine consequent of strings, and partial adhesions among the intestines. It has happened that the intestine has been entangled in the mesentery, which, however, has been improperly classed as a hernia, since it more properly belongs to *ileus*. There are other causes of obstruction to the bowels, as collection of hardened fæces, stricture, and schirrous contractions in the great intestines; but to embrace all these, would lead us from our proper object, and not serve to throw additional

* Saviard, Haller, and M. Hevin (Mem. de l'Acad. de Prus.) were of this opinion. The operation of Gastrotomy has been more spoken of and recommended by medical writers than by surgeons. We are told that the celebrated Nuck made a dexterous surgeon cut into the belly, and withdraw the volvulus of the intestines. But dissection shews that ere the symptoms will indicate any further malady than a common colic, the volvulus, or intus-susception, is past reduction. It cannot be reduced even in the dissected body, after the swelling and accumulation of the internal coats.

light on the subject of strangulated hernia. There is, however, a necessity of describing in this place what are the symptoms of obstruction to the intestinal canal.

SYMPTOMS OF OBSTRUCTION AND OF THE ILIAC PASSION.

These are, a sudden attack of great pain in the belly, followed by sickness and a call to stool, after which there is obstinate constipation. The pain often concentrates round the navel; there is a feeling as if a cord were tied there; or there is a tightness or a corded feeling across the upper part of the belly. Sometimes the pain is referable to some fixed part. There arises a flatulent distention of the bowels in some other part of the belly, which rolls with great pain towards this spot; is fixed there for a time, and then recedes gradually. At first the pulse is quick and hard; afterwards more feeble, even thready and quick. With this change on the pulse, the countenance sinks, and gives signs of great anxiety. There is general restlessness, hiccup, and fætid eructations. The abdomen becomes tense and painful, and pressure on it is insufferable. There is occasionally relief, and then again an accession of more violent suffering. The hair is wet with perspiration; a cold sweat is on the surface; the pulse becomes weak, thready, and intermitting, and the patient sinks.

Before death the pain subsides; but the anxiety and restlessness are not diminished; or at least the altered countenance denotes to the surgeon the

death of the parts, which were painful while sensible. And often the friends are deluded by a vain hope of amendment, to feel more acutely the fatal termination.

In the case of hernia we find, in addition to the constipation and other symptoms of ilius, a tumour occupying some of the passages above enumerated. The tumour is not moveable; it is more or less tense, regular, or knobby, according to the nature of the contents, the place of the hernia, or the continuance of the incarceration. There is a sensation as it were of dragging down of the stomach to the place of the stricture.

OF THE CAUSE OF DEATH.

On this subject, which is certainly of the highest importance, and which must be the foundation of all our rational practice, I will take somewhat more latitude of enquiry than strictly belongs to this elementary book; because I conceive it to be a subject very little understood, or very much neglected. Nor let my reader condemn me of arrogance, since I am going to state difficulties, rather than assume the merit of discovery.

When we lay open the abdomen of one who has died of ilius, from intus-susception, or internal strangulation, or from hernia, this is very frequently the state of the parts. There is a turbid serum in the abdomen. A few turns of the intestines occupy the whole belly, as it were, and they have pushed back and hid the part of the canal which was

below the obstruction. These distended intestines are full of flatus; are of a very high colour, and greatly inflamed, in some places approaching to gangrene. The colour of these intestines is a dark brown, sometimes they are of a dark purple, with spots of a more lurid lake colour, where the turgid vessels are more numerous. Puss and flakes of coagulable lymph lie on the surface of these intestines. The peritoneum is dark and full of vessels, but not in an equal degree with the distended intestines. There is a peculiar fœtid odour. When the dissector turns aside the violently distended and high-coloured intestines, he will discover others in a very different state, small, compressed, and having no colour or mark of inflammation. When he begins to unravel the confusion which this unequal distention produces, he finds the upper portion of the canal as he follows its tract towards the stricture or obstruction, more and more diseased; darker in its colours, and in a state approaching to mortification. The part that is actually noosed and strangulated, will be mortified: but below the strangulation, though for a little way as if affected by contact, the intestine is black and mortified: yet there is no distention, no shew of turgid inflamed vessels; but, on the contrary, the intestine is remarkably white, and free from blood.

Let us now compare these appearances with the symptoms; the violent tormina and twisting of the upper portion of the bowels, checked in the mouth of the herniary sac, is the cause of this

violent inflammation of the upper portion of the intestine. Let us consider how many survive, when only a portion of the canal is incarcerated, and the contents can still pass* through the intestine, and we shall be drawn to believe that death follows the high inflammation of the upper portion of the canal; and that the strangulation is fatal as an obstruction, not as an immediate and direct source of inflammation and gangrene. An idea is entertained, that the inflammation extends into the abdomen, from the tumour of the hernia; and the pain upon pressure of the belly, is conceived to be the indication of the spreading of this inflammation to the peritoneum; this opinion that the incarceration of the hernia is the direct cause of inflammation and of all the consequent evils, has occasioned the practice of administering stimulating medicines. But were it understood that the cause of death is the violent and incessant efforts of the intestines to relieve themselves from their load of increased secretion, flatus, and fæces, surgeons would seek to allay this violent commotion, instead of endeavoring, (by exciting the bowels,) to withdraw the strangulated gut at the expence of direct injury to it, and an aggravation of every dangerous symptom. It must be further noticed,

* That a part only of the diameter of the gut being fixed in hernia, will often destroy the patient, I do not wish here to conceal; but I believe it does so by preventing the natural action of the canal. The mere inflammation of a portion of the gut, without any mechanical obstruction, will give rise to obstinate retention of the contents of the canal.

that this evidence of violent inflammation in the upper portion of the canal as distinguished from the lower part is not always seen when the patient dies of unreduced hernia. I have witnessed a more general inflammation on the peritoneal surface of the bowels, but always in less degree than in the upper portion of the intestine. I have also observed the bowels comparatively little inflamed, (when the patient has died after the operation,) and where the portion of reduced intestine was quite mortified. Yet I affirm that it is the obstruction of the canal which kills the patient, in the greater number of cases, not the strangulation and injury to a part of the intestine: and the obstruction proves fatal by the violent working of the muscular coats of the intestines producing inflammation in them.

But there is evidence of the patient dying of the mortified intestine, where at least there has not been nearly the same degree of inflammation generally in the bowels. How far then does the variation in the appearance of the bowels on dissection, correspond with the variation in the time and manner of the patient's death? A previous question must be determined.

OF THE CAUSE OF STRANGULATION, AND THE QUESTION OF SPASM IN THE SAC OR STRICTURE.

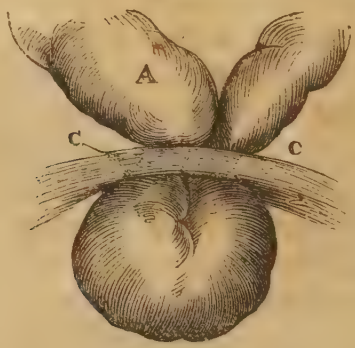
It is natural for us to turn to the last publication on the subject of which we treat. The author*

* "The same causes which produce hernia, render them strangulated."

does not appear to me to have the correct idea of the most frequent cause of strangulation. Most surgeons consider that when the intestine is "so begirt as not to be capable of executing its proper office, the person to whom this happens may be said to be in immediate danger." These are the words of Mr. Pott, and his conclusion results from the premises. If the view of exhibiting medicines be to extricate the gut from its stricture, and the discharge of fæces is to be regarded only as a necessary consequence of such removal; then I think it is clear, says Mr. Pott, that a power or faculty of stimulating or irritating the muscular coat of the internal canal, ought to be the property of whatever is administered. There seems to me no point capable of being so clearly established as this; that in hernia, the intestine is in a very high state of painful excitement and action; that purgatives increase this, and by a happy effort, as it were, draw the portion of the gut from its stricture I will not deny; but if they do not succeed in withdrawing the strangulated portion they must increase the inflammation, pain, and action, and accelerate the doom of the patient.

I have now to give my reason for thinking that the intestine is very seldom withdrawn from the stricture by the violent excitement of the upper portion, that is the portion betwixt the stomach and the part strictured. Suppose that instead of the uniform and smooth walls of the abdomen, every where presented to the bowels, there should occur a noose prepared by adhesion, or herniary

sac; and that in the motions of the intestine, or in consequence of the general pressure of the viscera, a portion of the gut passes into this cavity or noose, is the portion thus embraced incarcerated or strangulated from this? No, surely; for the next successive effort in the peristaltic and vermicular motion of the intestine, pulls the portion from its hole. It is as easily withdrawn as introduced. To incarcerate the included portion of the gut, the fluid content of the intestine must be pushed into the gut contained in the hernia, so as to distend it thus:



And now no effort of the gut A will withdraw the portion B from the neck of the sac C; because the incarcerated portion has been distended to the utmost, and now forms an angle so sudden and acute with the neck of the sac, that it cannot empty itself; and without being emptied, it cannot

be withdrawn. Two things result from this view of the subject. It is necessary, in order to incarcerate a piece of gut, not merely that it has escaped from the belly, but that beyond the hole or noose, by which it has escaped, it has the liberty of dilatation ; for if it be not distended, it will not be noosed, but be drawn back again, as it was pushed forth. Further, it appears from this, as well as from facts ascertained during operation or dissection, that the strangulated intestine must be a dilated intestine. During the operation of bubonocele, I have seen a portion of the intestine touched with the edge of the knife, and immediately it slipt up ; a lamentable error ! so the destructive practice of pricking the hernia was attended with the return of the intestine, because the flatus escaping, the intestine was no longer incarcerated. Stimulating the superior portion of the gut within the belly, in order to procure the retraction of the incarcerated portion, is dangerous, since it is as likely to distend it more as to retract it, and so by pulling on the hernia to confirm it ! To the stimulating of the lower portion of the gut, there cannot be the same force of objection. For whilst the effort of the intestine is made it has not the same tendency to distend the strangulated portion more and more, and by evacuation downwards, it can relieve itself of its stimulus.*

* Often where an incarcerated hernia gangrenes, bursts, and discharges its contents, the fæces pass freely from the wound, proving that the obstruction is owing to the distention of the gut, not to the stricture.

OF THE SAC OF A HERNIA MORE PARTICULARLY, AND OF THE PART WHICH FORMS THE STRICTURE IN STRANGULATED HERNIA.

The term rupture we have understood to be improper, since it was adopted from an idea that it was the bursting of the peritoneum which produced the hernia. The peritoneum descends before the viscera, and forms what is called the sac.

In a recent hernia, the sac retains much of its original character of peritoneum; but in old hernia, it is dense, thick, and opaque, more like the dura mater than the peritoneum. In the different herniæ, the peritoneal sac varies in thickness in a manner not easy to explain. The hernia which comes down through the spermatic passage has the strongest and thickest sac. The femoral hernia has a weaker sac; and the umbilical hernia is peculiar in the very great irregularity of the sac, for while we see ribs or strings, which like cords are capable of cutting the intestine, it suffers absorption in such a manner as to disappear in some places altogether.

We have already observed, that there is an incessant muscular pressure on the viscera within the belly, while nothing but the firmness of the cellular membrane resists the increase of the herniary tumour. The first stage of the progress of hernia is by dilatation or elongation of the peritoneum; but the succeeding increase is more of the nature of a growth than of dilatation; for the stretching of the

sac by the contents produces an excitement in the membrane or its vessels, which accumulate new matter, giving the membrane thickness and strength which it did not naturally possess. Even in the most recent hernia, the sac is not merely the peritoneum dilated ; for it will not retract to its former limits, nor suffer to be pushed within the ring, without lying in unequal folds. From seeing so many subjects with small protrusions of the peritoneum, through the openings of the belly, without any contents, and being persuaded that often there must be a hernia of the peritoneum (if I may use such an expression) before there is a hernia of the gut, I imagine part of the omentum to be in this case the substance which has carried these processes of the peritoneum before it and under the ligaments or tendons. In the subjects of a dissecting-room, we very often find small prolongations of the peritoneum, like the finger of a glove, stretching through the ring, or under the ligament of the thigh. Either these must precede the proper hernia, or the little sac is as yet of such a form that it does not admit the distention of the piece of gut which is forced into it : as I have observed above, to strangulate the gut, it is necessary that the sac admits of its distention.

NECK OF THE SAC.

As the body of the herniary sac increases in thickness and strength, so does the neck ; and often the neck of the sac is thickened in a much greater degree than the lower part of the sac. It

seems to me strange that any one should ask what produces this thickening in the neck of the sac, or how it comes to pass that the peritoneum should be a cause of strangulation. My preparations assure me that this is the fact. But, besides, does not the delicate omentum, when inflamed and adhering, strangulate the gut? Do we not see that part of the omentum which is in the neck of a hernia become firm, stringy, and of a tendinous strength? Do we not often find that the transverse cords, originally formed of the coagulable lymph, do actually strangulate the intestines, and even cut them through? And shall we not allow that the neck of the sac (the most exposed to every possible excitement, and always suffering in an equal degree with any part contained within,) is always in some degree firmer than the natural peritoneum, and sometimes of a tendinous hardness? I have never seen the case where the hernia could be with safety reduced without cutting the sac, the necessity for an operation being previously well marked. I will very boldly say, because I think I am bound to say, from what has fallen under my observation, that the neck of the sack must be cut as well as the tendon which surrounds it, and that of the two it will be better to cut the thickened sac, and leave the tendon uncut, than to cut the tendon and leave the neck of the sac to be dilated by the distention of the gut in the herniary sac. Even when the herniary sac is laid open in the course of the operation, we must be careful to draw down the tender portion

of the gut which is engaged in the stricture before we press the flatus from the gut.

The neck of the sac should be made so free that a gentle force can push the contents of the gut engaged in the hernia into the portion within the belly. I believe that this degree of freedom may be measured by the circumstance of the easy admission of the point of the finger into the neck of the sac. On one occasion, when I was assisting in this operation the surgeon seemed fearful of wounding the epigastric artery, of which he had heard so much, and he attempted to push back the gut (which was free of inflammation and quite natural) without cutting up the neck of the sac. After vainly attempting this, he was obliged to complete the operation in the usual way. The man did well for some time ; but on the third day he had untoward symptoms, and the belly swelled, with great pain. He died of peritoneal inflammation. The portion of the gut which was in the hernia is represented in one of the plates of this volume. We see that all the inner coats are torn asunder, and the peritoneum only remains. In the peritoneal coat there is a small hole, which had given way by ulceration, after the reduction of the gut, and from which the contents of the intestines passed into the cavity of the peritoneum, and destroyed the man by raising inflammation.— Such is the consequence of boring the finger into the neck of the sac, and endeavoring to reduce the gut through too narrow an orifice. In another plate I give the view of a gut burst at the place

which had been grasped by the neck of the sac, in consequence of its being reduced by the hand, without operation by the knife. Am I not now warranted in concluding that the gut, after lying some time incarcerated by the pressure of the neck of the sac, is incapable of bearing such a force of distention as will extend the neck of the sac ?

The last point I shall touch upon in this introductory view of the subject is that of SPASMODIC STRICTURE.

A notion is entertained that the contractions of which the patient is sensible in the case of bubonocele is owing to the contraction of the muscle at the neck of the sac. It is said that the ring of the abdominal muscle, being of a tendinous nature, cannot partake of spasmodic stricture, therefore it must be the edge of the internal oblique which, embracing the neck of the sac, gives occasion to the spasm ; but I know not what the peculiar symptoms of the bubonocele are, which warrant the conclusion that an explanation of the origin of muscular and spasmodic contraction in this species of hernia, can be held to put the question to rest in regard to all the others ; for all the kinds of hernia are subject to the same subsiding and rising of the pain, the same succession of alternate drawing towards the stricture and relief, the same feeling of binding and strangulation at the seat of the stricture, which has given rise to the idea of the stricture being spasmodic. In short, with all the confidence which a man may have in

so difficult and important a subject, and in opposition to one so deservedly high in the estimation of the profession, I say that these symptoms of spasmodic stricture are referable to the action of the gut, not to the neck of the sac, or membranous bands.

OF INCARCERATION AND STRANGULATION.

The incarcerated hernia is different from the irreducible hernia, on the one hand, and from the strangulated hernia on the other. Incarceration consists in the portion of the intestine included in the sac being so gorged with fluid or flatus that it cannot be withdrawn or reduced, at the same time that it causes a total stop to the course of the food. But the strangulation of the intestine in a hernia implies that the source of its life and circulation is cut off; the vessels are compressed so that it quickly mortifies. A hernia may be incarcerated, and the motion of the bowels obstructed for many days; but when there is strangulation added to this, then the fate of the patient must be quickly decided; for, being deprived of circulation, a few hours will destroy the life of the gut.

Before the life of the strangulated gut be destroyed, its power of action is destroyed; and often when a strangulated gut is reduced, by enlarging the stricture it will still refuse its office.

Herniæ have been classed into the acute and chronic. This appears to me a misapplication of the terms.

To produce hernia, there must be predisposition, and there must be an immediate cause. The former consists in an unnatural laxity, and wideness of the openings through the tendons of the muscles. This laxity can differ only in degree; and the degree of width in the ring, or under the ligament of the thigh, makes all the distinction.

When there is great laxity, the tumour forms slowly; the bowel gradually descends; it is protruded with every slight effort of the muscles of the belly; it is not apt to be strangulated, because the opening is wide. The hernia often appears in infancy or early youth, and remains long without dangerous consequences resulting from it.

This they may call a chronic case; but it is liable to become as quickly fatal as any other, by the descent of a new portion of gut or omentum, or by unusual congestion in the contents of the hernia.

When there is less predisposition to the disease, a more powerful exertion is necessary to produce the hernia. The opening through which it comes down is small, the gut is more closely embraced, and the progress from incarceration to total obstruction of the circulation of the part, and strangulation is rapid. And so on this account it is true that the young and robust are more exposed to strangulation, while in children in whom the disposition, that is, the width of the passages, is great, and in old people where the hernia has become large and wide, there is less danger of the intestine being rapidly strangulated.

The terms acute and chronic are better adapted to signify the natural type and tendency of a diseased action. The distinctions in the progress of hernia depend on a mechanical effect.

CHARACTER OF THE HERNIARY TUMOUR.

Herniæ are to be distinguished from other tumours by these circumstances.

1. The situation as implying the protrusion of a bowel through some of the passages; for example, when the tumour covers the abdominal ring, or lies on the top of the thigh, or on the umbilicus.

2. By the impulse communicated to the tumour when the patient is made to cough.

3. By its being returnable into the belly at night, or when the patient is placed in a recumbent posture. (Although this be not the case when you examine, yet inquire if it was not once so.)

4. By the elasticity of the tumour. When the hernia contains intestine, it is elastic; if the intestine is returnable, the tumour is compressible, and accompanied with a gurgling noise;—if incarcerated, tense as a ball, yet distinguishable from a solid body. When the tumour contains omentum, it is more irregular.

5. By diminishing on pressure. If the tumour disappears, and still the openings in the tendons are obscured by something foreign there; it is the empty sac.

6. When the intestine is incarcerated, and the symptoms of intestinal obstruction succeed, there

is pain referable to the part, and a drawing down of the belly to the ring.

7. The tumour, without the internal evidence of symptoms, would often be insufficient to announce with sufficient accuracy, that the disease was a hernia, and to warrant operation. I have operated where the inguinal glands clustered about the sac, so as to obscure its natural character; and I have assisted in an operation on a lady, where two hydatid tumours attached to the sac gave it a very great obscurity. In general, however, by continuing the pressure with the fingers in the examination of the neck of the tumour, we shall be enabled to ascertain that the tumour does actually proceed from within, and that it comes through the enlarged opening of the tendons.

8. A hernia is a tumour without discolouration. Yet there are exceptions to this rule: I have seen surgeons deceive themselves because of the redness of a femoral hernia, and insist that it was a bubo.

9. When strangulation takes place the tumour becomes more tense, resisting, and painful. The patient suffers great pain in handling the tumour. The general symptoms in unison with this are the pulse small and quick, the hiccough, and the altered visage.

OF HERNIA DESCENDING THROUGH THE RING OF THE ABDOMINAL MUSCLES.

THE INGUINAL HERNIA we have found to be that which descends through the ring of the external

oblique muscle of the belly, and SCROTAL HERNIA to be the increase and further descent of the same tumour.

WITH WHAT DISEASES IT MAY BE CONFOUNDED.—The testicle partially descending at a period of life later than usual, may be mistaken for inguinal hernia : often a truss has been applied in this case. I have seen the operation for bubonocele performed for the tumour of the testicle ! The scrotum being empty of the testicle should put us sufficiently on our guard.

A sac of fluid formed upon the cord, or the cellular hydrocele of the cord, may be mistaken for this kind of hernia. If large, the tumour may be known from its transparency, its uniformity, and elasticity ; it does not receive the impulse from coughing, as the hernia does.*

Varicose enlargement of the spermatic veins may be mistaken for this kind of hernia. But the tumour has a woolly, or sometimes a stringy feeling. Further, the blood being squeezed from the vessels of the cord, if we press with the finger on the ring and upper part of the cord, the tumour will return by a uniform enlargement, (and not a descent from above,) in consequence of the filling of the veins with blood, through the arteries of the cord and testicle.

In hydrocele of the tunica vaginalis, the tumour is often precisely of the form of a scrotal hernia.

* Sometimes, however, it does receive the impulse, when the dropsy of the cellular membrane of the cord extends much into the abdomen.

It will be distinguished, however, by its uniformity ; its transparency ; its not receiving the impulse when we make the patient cough ; its history, particularly as it will be found that the tumour began in the testicle, and gradually extended upward, while in hernia it begins in the groin, and falls down into the scrotum. In children the encysted hydrocele of the spermatic cord is particularly apt to be mistaken for hernia.

I have seen four surgeons unanimously of opinion, that a bubonocele was a suppurating inguinal gland. The history and the urgent symptoms should always enable us to distinguish the scrotal hernia from enlarged testicle or hæmatocele, and the bubonocele from a diseased gland.

In most common kinds of inguinal hernia, the tumour comes down obliquely inward and downward ; and this may be distinguished by a fulness within the tendon of the external oblique muscle, on the side of the ring nearest the ilium ; sometimes, however, the bowels burst out directly behind the ring of the external oblique muscle. In this case the neck of the sac will be found on the inside of the epigastric artery.

When the hernia has escaped from the ring, it often carries some of the tendinous bands with it, which are dispersed upon the neck of the sac.*

* I find in late authors, that the abdominal ring, as it is called, is still very ill described, as a splitting of the fibres of the tendon. Were it so, the spermatic cord would unquestionably be strangulated by the action of the abdominal muscles, and there would be no chance of the gut in hernia escaping mortification, as in the natural anatomy we find the lower margin of the ring turned out spirally, while the lower part of the pillar

Over these fibres the membranous expansion comes down from the muscles of the belly, and, being considerably strengthened, forms an outer layer to the coats of the tumour. When the surgeon in his operation has slit up this, he still finds another membrane, which I should say was the expanded web of the cremaster muscle, if I had not observed it so particularly strong in the hernia of the labium in women. Under this there is still the sac, the prolongation of the peritoneum, much strengthened by the acretion of new layers of cellular membrane.

When the hernia comes down through all the length of the spermatic passage the sac is before the cord, and to the outside of the epigastric artery. When the hernia comes out more directly by the side of the tendon of the rectus muscle, the sac will often have the vas deferens and the vessels of the spermatic cord scattered on its forepart.

OF THE REDUCTION OF THE INGUINAL HERNIA BY THE HAND.

THE TAXIS is the reduction of the contents of the herniary sac, by position of the patient, and pressure of the hand.

runs straight to the os pubis. This direct insertion of the inferior part of the lower pillar checks the drawing of the spiral fibres, which would otherwise embrace and confine the spermatic cord too closely. In hernia, too, and certainly in old hernia, the marginal fibres of the ring are not merely split and held aside by the hernia, but stretched and carried down upon the neck of the sac, so that no pulling of the muscles of the belly operates on the neck of the sac.

To accomplish this reduction, the patient is made to rest on his head and shoulders, his hips and thighs are raised and supported, and of consequence the spine is curved, and the muscles of the belly relaxed. The thighs must at the same time be supported, and brought near together, that by relaxing the fascia the ring may in some measure be relaxed.

One arm of the surgeon being now passed betwixt the thighs, both hands are applied to the tumour, the first effort being gently and uniformly to compress it. By this it is intended to press the fluid contents of the intestine, which is in the sac, into that part of the canal which is still within the belly; for unless the distention of the incarcerated gut be diminished, how can we expect the gut to be returned through the narrow ring? Having succeeded in diminishing the tumour, we then endeavour to accumulate the sac towards the lower part, and at the same time to direct the upper part of the tumour towards the centre of the ring; or we embrace the whole tumour with the palm of the hand, and make the ends of the fingers knead and direct the neck of the sac, while the fingers of the other hand keep pressure on the margin of the ring, guarding the portion already reduced from falling down.

If this fail, we try a variety of positions, the hanging of the patient by the thighs, &c.

I know of no error more common in reducing hernia, than pushing the tumour to one side of the ring, by which the neck of the sac is twisted,

and the reduction made impossible, however great the force may be which is used. This will be the effect of pushing the tumour towards the anterior and superior process of the ilium, as recommended by the latest authority.

When the hernia consists in part or entirely of omentum, the reduction is often difficult, from its being a solid and incompressible mass, which must be reduced every inch by the pushing of the fingers, and the kneading of it, as it were, into the ring.

The exertion of the surgeon in reducing hernia should rather be persevering than violent. The parts when uniformly supported by the sac do in general bear a great deal; and certainly often after twenty minutes' exertion, we succeed. But every one must see even early in practice examples of inflammation, accelerated by the violence of this operation, and I have known the consequence of violence to be the actual rupture of the bowel.

When the strangulation is advanced, or complete, our efforts must be more guarded, and less persevering.

Failing by mere mechanical cunning to reduce the hernia, we must excite the bowels; and I have already said, that the laxative medicines given by the mouth ought not to be of a drastic nature, and that we should trust to clysters chiefly. These must not consist of a little fluid to excite the rectum, as in a common case; but the whole of the great intestines must be distended by the repeated discharge of the syringe.

This failing, we give the infusion of tobacco (a pint of water to two drachms of the tobacco); and during the delay of the operation of these we apply cold cloths to the tumour. We have also the warm bath prepared, and bleeding and the warm bath may produce a languor and faintness favorable to reduction; and we attempt the operation again, while the patient is in the bath.

A, *the cord.* B, *the ring (we shall suppose).* C, *the pad applied here will chafe and compress the cord. Applied at* D, *it will often with more ease, and as effectually, support the rupture.*

OF THE TRUSS.

When the hernia is reduced, we still feel the empty sac; and now the surgeon must be particularly careful that no portion of the gut or of the

omentum remains in the neck of the sac, when he is about to apply his compress or truss; for high inflammation, or all the effects of strangulation, may result from this.

Still keeping the patient supine, with the muscles of the belly relaxed, we examine well where the finger sinks into the ring, and if possible distinguish the course of the cord. We then try whether pressure towards the outer side of the ring does not effectually support the hernia. This it will do, if the passage of the neck of the sac be at all oblique through the abdominal tendons. If this be the case, then the pad of the truss is to be applied to the side of the ring, and so far removed from the crest of the pubis, as not to press the cord against the os pubis.

When the pad of the truss is applied, as in the place of the circle D, it may prevent the oblique descent of the hernia; and yet as it does not press against the bone, no pain, swelling, or varicose state of the cord follows. But most generally the passage is so direct, that the pad must be placed as on the circle C, in which case the only resource is, so to tease out and knead the hair of the pad, so as to be of the form of the dotted line E, that a kind of channel be left for the lodgement of the cord.* A hard pad and strong spring wastes the substance about the ring, leaving only the tendons and skin. By perseverance in the use of a proper truss, the

* Baked hair is the proper substance for the pad; and often the patient will himself give a form that sits with perfect ease, when that given by the maker chafes and irritates.

neck of the sac may be made to adhere; but in the adhesion of such membranes, unsupported by a change in the tendinous ring, I have no faith as a support against the recurrence of hernia.

OPERATION FOR BUBONOCELE AND SCROTAL HERNIA.

That it is a hernia is clearly distinguishable; the symptoms are urgent; all due effort has been made by the taxis; bleeding, the warm bath, the stimulating clysters have failed. What do you wait for? I hope not more formidable symptoms to cover your responsibility?

The parts are shaved. The first incision is carried through the common integuments only, beginning about an inch and a half above the base of the tumour, and reaching to the bottom of the tumour if it be bubonocele. If the knife be carried to the bottom of the scrotum, the tunica vaginalis testis may be opened. The blood escapes from the external pudic arteries, but seldom requires the tenaculum.

The fingers being spread upon each side of the incision, or the tumour grasped by the hand on the back part, the small transverse slips of cellular membrane which may remain are touched lightly with the edge of the knife. Then the thin aponeurotic membranes are scratched with the knife, when the grooved directory is thrust under them, layer after layer, and the edge of the knife run along the groove, until the thin or at least the bare lamina of the peritoneum appears.

Let it be recollected that though rarely, yet it sometimes happens that the spermatic vessels (and particularly the vas deferens,) are spread on the fore part of the sac of the bubonocele. So that the patient may be castrated by a stroke of the knife even before the sac is opened! Therefore let the neck of the sac be cleared, and made distinct by a little dissection.

With the forceps the proper sac is now pinched up and cut, by carrying the knife horizontally; a little fluid escapes. The probe or directory being introduced, the opening is enlarged, when the finger may be put into the sac, and the sac slit up towards the ring.

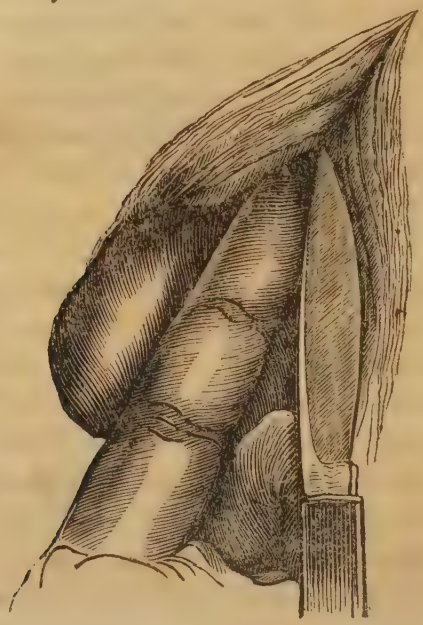
In doing this, there is no apology for haste; and even if any slight doubt arises whether or not this is the sac which we have exposed, then we run in the directory under the membrane. If this be only a layer of cellular membrane, the directory passes with difficulty; if we have penetrated the sac, the point passes easily. Again, we are not always to expect the dark-coloured gut; but the fatty cellular substance of the omentum may present; nay, that fat may be adhering to the sac, which may still more perplex the young surgeon.

Fluctuation in the sac I conceive to be a very rare occurrence; nor are we to value highly the prognostic from the colour of the fluid which escapes, since we have the parts themselves under our inspection.

The surgeon now introduces his finger into the neck of the sac, and feels the place and degree of

the stricture. If he can easily introduce the point of his finger into the belly, he may try to reduce the gut without further cutting. But this is not likely to be the case ; and to endeavour to dilate the narrow neck of the sac by the finger, is as full of danger as the attempt to compress the gut is, and forcibly to reduce it. I have given a plate, in which we see the effects of violence in this part of the operation.

If the tip of the finger be admitted into the mouth of the sac, then the ring and the mouth of the sac being raised on the point of the finger, the transverse bridling fibres are to be scratched with the point of the knife ; when the finger may dilate what remains. But again I say do not bore the finger forcibly into the mouth of the sac.

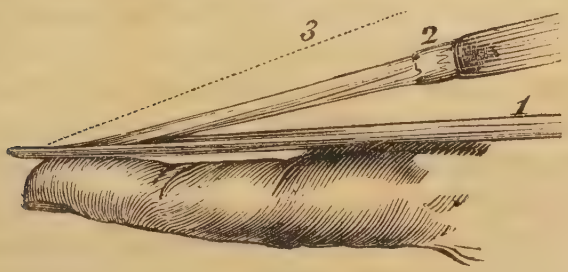


The point of the finger is put into the neck of the sac, so as to lift up the edge of the tendon: the knife is then carried forward on the finger, and what is felt firmly constricting, is cut fibre after fibre with the point of the knife.

The direction of the incision of the stricture is directly upwards.

When the finger enters easily, the stricture is sufficiently taken off.

If the neck of the sac does not admit the finger, then the assistant holds down the distended intestine, and the surgeon insinuates the directory betwixt the intestine and the stricture, and with the probe-pointed bistory he cuts the mouth of the sac and the ring.



In this part of the operation, the directory, 1, lies along the finger. The bistory, 2, is introduced along it. But now we do not cut with a sawing

motion of the instrument, but by merely raising it (as from 2 to 3.) By this means, only the strongly resisting parts of the tendon are cut.

The edge of the knife is directed across the fibre of the tendon, upwards, neither inclining to the pubes nor to the haunch.

The finger now follows the directory, and enters the stricture, or passing it through what appeared to be the chief stricture, another, (the firm inner margin of the neck of the sac,) may be felt strongly embracing the gut, where it comes first from the cavity of the abdomen. This inner stricture is to be cut like the last, the assistant holding up the ring with the blunt hook, and guarding the intestine below. The first object being to introduce the tip of the finger, it will be found that when the neck of the sac is cut, very little of the proper tendon will require to be cut, and it ought to be cut using the bistory like a lever, and raising the edge of the knife against the tendon.

The stricture being only as it were touched with the edge of the knife, the intestine is to be gently drawn down, and having by this means freed the more delicate part of the intestine from the stricture, we press the whole portion uniformly and gently to discharge the flatus from it; after which it is to be reduced. But if we find that the first touch of the knife does not permit us to draw down the intestine, the stricture is to be enlarged.

OF THE DIRECTION OF THE INCISION OF THE RING, AND OF THE PROPRIETY OF CUTTING THE RING WITHOUT THE NECK OF THE SAC.

It has been recommended to divide the stricture, by passing the knife betwixt the ring and the sac, as a larger portion of the peritoneum is thus left uncut, and the cavity of the abdomen is afterwards more easily closed. In many cases, this is not practicable ; and in the general question, the propriety, I think, is doubtful. It must be very difficult to do this when the stricture is narrow, and the distention of the intestine included in the hernia great. It must be difficult to dissect the tendinous circles which are around the neck of the sac, from the sac itself, especially in an old inguinal hernia ; and when this is done, the sac will still resist in a degree which requires the forcible introduction of the finger, and endangers the intestine. It will be recollected, that no cutting of the ring, in nine of ten cases of hernia, would be required, were we at liberty forcibly to bore and stretch the mouth of the sac. But this forcing of the mouth of the sac is full of danger to the intestine.

Le Dran did what is sometimes possible, reduce the sac with the intestine. This was proceeding on the mistaken idea, that it was the tendon of the ring only which caused strangulation. The patient died of strangulation, the intestine being still embraced in the neck of the sac. If this

circumstance stood unsupported, I should not quote it, but from what I have said in speaking of the herniary sac, it must, I think, be evident, that althongh the sac may not be the original cause of stricture, yet it becomes in part the cause where the hernia has been of some standing.

The tendon requires to be cut very freely to allow of the dilatation of the neck of the sac, inflamed and condensed by the continued pressure; and as the cause of hernia is originally in the deficiency of the tendons, or in some malconformation, so will the hernia be particularly apt to recur wherever these tendons are cut extensively. Further, when the neck of the sac is cut, it readily adheres, or the inflammation condenses and gives firmness to the cicatrix; but when the neck of the sac is not cut, we cannot expect adhesion or contraction of it so readily to occur.

The only question that remains in my mind is this, whether will the inflammation of the peritoneum, that is, of the general cavity of the abdomen, be more apt to follow when the neck of the sac is cut, or when the cut is carried within an inch of it? On this point I should wish to have more facts from dissection of the parts after unsuccessful operation. But in the bodies that I have hitherto dissected, the inflammation did not spread from the cut of the mouth of the sac, along the surface of the peritoneum. The inflammation evidently had its origin in the intestine.

The stricture higher in the neck of the sac,* Mr. Cooper imagines is produced by the pressure of the transversalis muscle of the abdomen; and he recommends the following manner of cutting it.

The surgeon passes his finger up the sac, and through the abdominal ring, until he meets with the stricture. He then introduces the probe-pointed bistory, with its flat side towards the finger, but before the sac, and between it and the abdominal ring, his finger being still a director to the knife. Thus he carries the knife along the fore part of the sac, until he insinuates it under the stricture formed by the lower edge of the transversalis and internal oblique muscles; and then turning the edge of the knife forward, by a gentle motion of its handle he divides the stricture sufficiently to allow the finger to slip into the abdomen. The direction in which this stricture is divided, is straight upwards, and opposite to the incision of the outer tendon.

I cannot help expressing my conviction of this being a very difficult operation; for either the muscle has firmly embraced the peritoneum, still of its natural tenuity and elasticity, or the mem-

* This stricture, high and in the mouth of the sac, I have long known, as may be seen in my Dissections.—"I have found, in operating on the inguinal hernia, that the constriction was not in the ring, but in the peritoneal sac, fully two inches within it; and in the case to which I allude, the strangulation was so complete that the gut was gangrened." Appendix, p. 5. Cases occurring since have confirmed me in the opinion, that this internal stricture is in the peritoneum, and surrounding cellular membrane, more than in the tendons or muscular fibres.

brane has inflamed under the pressure, and is thickened. If the first supposition be the true one, then will it be difficult to force a probe-pointed bistory under the edge of the muscle; a sharp one would pierce the peritoneum; and if the membrane is thickened, the sac will resist after the tendon or muscle is fully cut. Further, if the stricture which we feel be the natural embracing of the parts, then, be the fibres tendinous or muscular, a strong directory, introduced over the mouth of the sac, will tear up or stretch them so that the knife is not required in these dangerous depths; and if, as I think I have ascertained in most cases, there is a general thickening of the sac, or of its surrounding cellular membrane, this deep dissection on the outside of the sac will not be sufficient to undo the stricture, without the force of the finger within the neck of the sac. That in several cases the stricture is in the sac cannot be doubted. I suspect that the sac, in all cases above a few days standing, is more or less condensed, and that when inflammation or compression has been for any considerable time, although the stricture may have originally been on the outside of it, it is no longer entirely so.

If the point of the finger bolts up against a thickened and entire ring, it is a stricture which encircles the neck of the sac, and should be cut from within the sac; for if it entirely encircles the neck of the sac, it is no stricture from the margin of a muscle or tendon. Were the stricture from the margin of the muscle, there would only be

a corded feeling on the upper side of the neck of the sac.

Sharpe, after speaking of the manner of cutting the neck of the sack, continues:—"If, upon examination, it shall appear that the intestine is strangulated within the abdomen, which may possibly happen from a contraction of the peritoneum, near the entrance into the sac, in that case the incision must be continued through the length of the contracted channel, or the consequence will be fatal, notwithstanding the intestine be restored into the belly. On this account the operator should pass his finger up the sac, into the abdomen, after the reduction of the gut, in order to discover whether it be safely returned into its proper place. The opening being made, the intestine is gradually to be pushed into the abdomen," &c. *Sharpe's Operations, ninth Edition, page* 26.

Monro observes, "After the bowels are reduced in appearance, the surgeon ought to search with his finger lest there be any contracted ringlet, crossbars, or productions of the peritoneum above the ring of the muscle, which might continue the strangulation of the gut, that they may be cut to make the gut quite free. Such rings," he continues, "are most readily to be met with in people who have long worn trusses."

In Mr. Hey's tenth case, he thus expresses himself:—"The stricture was not formed by the ring, but entirely by the neck of the hernial sac, into which I could not introduce my finger. I was obliged to divide the ring pretty high, that I

might with safety divide the neck of the sac; and this last division was effected by cutting along the groove of a director, till I had made a sufficient aperture for the introduction of my finger." In his remarks upon this case he continues:—"This case affords a decided instance, in addition to others already published, that the neck of the hernial sac is capable of becoming so contracted as to produce a fatal strangulation."

It has appeared to me, in the following instance, exactly as it is here represented. A part of the colon was included in an inguinal hernia: the intestine being freed from the sac, rose in a remarkable degree, so that it could not be held down to expose the ring. Upon cutting the ring, however, pretty freely, so that the finger was introduced with ease, still the intestine was much distended, and could not be reduced. Upon introducing my finger about an inch within the outer ring, I felt a narrower ring than that without, and which had been cut. I carried my finger up to it, and cut it a little with the point of the probe-pointed bistory, and enlarged it with my finger. Here I am sure, if I had thought it right to dissect on the outside of the neck of the sac, I could not have done it. If it were asked, Why do I suppose that this internal stricture was from the sac? I should say, that it was perfectly circular, and like a firm ring; not as if the membrane was merely bound down by a slip of tendon passing over it, or the edge of the inner muscles of the belly. And further, in dissection in similar cases of bubono-

cele, I have found the stricture at this place still resist the finger, after all the fibres of the surrounding muscles were dissected off. The appearance of this stricture in the peritoneum is represented as I have found it on dissection.

And now as to the outside of the neck of the sac, there is something necessary to be observed. The term Abdominal Ring has been taken not from the natural appearance of the parts on dissection, but the appearance or rather the feeling, during operation. For the frequency of the disease, and the occasion of operating, gave opportunity to observe the state of the parts in disease, before dissection was practised, when the operators knew not the natural anatomy.

In recent hernia, and before the condensation of the surrounding cellular membrane has confounded the parts, we can easily distinguish betwixt the tendons of the ring, or Poupart's ligament; but when the inguinal hernia is large, and of long standing, a firmer circle or ring may be felt, when the finger is introduced into the mouth of the sac: but on the outer surface there is no such distinction betwixt the sac and the tendon of the abdominal muscle; for as the hernia enlarges, and pushes lower, the tendon of the external oblique muscle is stretched, and expanded over the neck of the sac; and at the same time, the general expansion of condensed cellular membrane, which covers the abdominal muscles, acquires more strength and thickness, and further covers the inequality which might otherwise enable us to dis-

tinguish between the neck of the sac and the abdominal tendon. Even in the bubonocele of women, as represented in the plate, we see that these uniting lamina of aponeurosis covering the sac, are very strong.

Many before the time of Pott imagined that the strangulation of hernia was in the contents, and that the stricture was an accident arising from the inflammation and distention of the gut; or, in other words, that the intestine was first inflamed, and, by means of the alteration produced by such inflammation, it became too large for the tendinous aperture, which therefore made a stricture upon it*. This is an opinion which has arisen from the inflammation, and perhaps the obstruction, being so frequently continued after the operation. This led them to a very dangerous conclusion, that freeing the intestine from the stricture was not removing the disease.

Indeed, when we consider that the tendons or ligaments are never more contracted than natural, but on the contrary, always more stretched, and forming wider openings than natural even in strangulated hernia,—when we find that they are parts the least capable of change of any in the body, and certainly of any of the parts concerned in hernia,—we see a good reason why surgeons should reject the idea that the tendon is the active cause of strangulation. We must take it as a settled point, I conceive, that the muscles and tendons of the abdomen are merely passive in the change pro-

* See Pott, p. 91.

ducing strangulation in hernia. When a small hernia bursts through the split tendon of the abdominal muscle, the columns of the tendon, in whatever part of the belly the rupture may have taken place, will be drawn tight on the neck of hernia, and cause strangulation. But when a hernia remains down, and the economy of the included portion remains for a time perfect, the strangulation which may afterwards take place arises from other circumstances than the tendons surrounding the sac; and although we may still say that these tendons form the stricture, yet are they passive only. They are as wide as they were; nay, often, as I have said, dilated. It is the swelling of the parts within which is the cause of the incarceration and strangulation.

The parts within the stricture are the peritoneum, and surrounding cellular membrane, and the gut or omentum, included in the peritoneal sac. How the former will be strangulated independent of any change in the sac, I have already described.

But let us observe how a stricture of another kind, (be it the omentum, or the adhesion of the intestines, or strings of coagulable lymph formed betwixt any of the bowels,) become thick, and inflame, in consequence of the strangulation of the gut, and then we shall understand how an incarcerated hernia produces a reciprocal influence betwixt the gut and the peritoneal sac; and that while the former is irreparably injured, the latter becomes thickened, and its attached cellular mem-

brane distended by the infiltration of coagulable lymph.

It is this condensed matter of the neck of the sac which must be cut through in operation, in nineteen of twenty cases, or else an undue and a dangerous degree of force must be used to distend it, by compressing the lower part of the convolution of the gut which is contained in the hernia.

It is alleged, that if we can disengage the hernia by means of cutting the tendons on the outside of the gut, without piercing the sac or peritoneum, it may be done very freely. This is precisely what I object to. You cut freely the tendons of the muscles, which are the only support of the bowels in future ; while in cutting both the sac and tendon, you cut very little of the latter, and the neck of the sac is consolidated in the cicatrix, so as to supply the defect in the tendon.

A MORE PARTICULAR INQUIRY INTO DR. MONRO'S PROPOSAL OF OPERATING BY CUTTING THE TENDON ONLY.

The first Monro had proposed, in cases of strangulated hernia, with adhesion to the sac, to relieve the stricture merely, and to allow the parts to remain. His son, in his work on the *Bursæ Mucosæ* proceeding upon the acknowledged principle, that sacs and cavities, when opened, were prone to run into universal and dangerous inflammation, proposed to relieve the stricture of the tendon, and to return the bowels without dividing the sac. This

Dr. Monro at the same time acknowledged was a proposal of Petit, only, observing that the author mistook the principle on which the operation should have been done.

In his first case, with Mr. Alexander Wood, a case of crural hernia, they cut the tendon, and then reduced the hernia *with the utmost ease*. In the next case (of hernia congenita,) they found the neck of the sac contracted, and requiring to be cut. In another, a large hernia, by cutting the tendon, the bowels were reduced. In the fourth instance, they found it necessary, after cutting the tendon, to puncture the sac, and cut its neck.

On this proposal, and these original cases, I would remark, that it is an error to conceive that first cutting the tendon, and then trying to reduce the hernia, is a harmless operation; and if not successful, may be followed by the incision of the neck of the sac. For to free the stricture of the tendon requires a very free cut; and to have after this to cut the sac, makes the whole incision too large.

I have always observed, that when the cause of the stricture was mistaken, the incision of the tendon was particularly large, as in the plate, where I have represented the epigastric artery cut. Now here the surgeon cannot say, until he has cut very freely, whether he has cut enough or not; for the difficulty may be in the sac.

Further to compress the sac so as to dilate its neck, must be dangerous to the already constricted

and injured gut at that part. If it be said, Why is there now more injury done to the gut than when the taxis only was employed? I would answer, that before the incision, the gut was more uniformly supported, and less exposed to injury, now the upper part of the sac is dilatable, while the intestine is held in the neck of the sac; and the same degree of force employed now as in the taxis, must injure the intestine.

In the operation without cutting the neck of the sac, the stricture is dilated, from the compression of the gut by the hand on the lower part of the sac, distending the gut within the neck or stricture. This distention of the stricture by the gut I conceive to be the objectionable and dangerous part of the operation. You know not how far you may proceed: you know not whether the difficulty be in the neck of the sac, under the stricture of the tendon which you have cut, or further up within the neck of the sac; or whether or not it be an adhesion which is preventing the return of the hernia. You use the utmost degree of force before you can ascertain whether the neck of the sac will dilate or not. It is no argument in my mind, to say,—You have done your utmost before incision to return the hernia; why not now?

The fact is acknowledged, in the circumstances of a case which comes to be cut by the knife, that the proper degree of force allowable in the operation of the taxis, has been already applied without effect. Then I find that there is a firm stricture

in one half of the cases which the promoter of this method has given us. There is even, in his estimation, an equal chance that there is a stricture in the peritoneum, which we are to try to undo by this pressure of the gut; and failing, we are to cut the neck of the sac itself. Now, when I turn my recollection to the cases from which the plates representing the bursting of the gut were taken, I remember how easily the gut is injured in the narrow sac of a hernia, when the whole force employed comes to act on that part; and in fairly considering the whole subject, I see more probability of injury than of good resulting from the proposal.

Supposing, however, that in the generality of cases, this method of Dr. Monro's were inadmissible, as certainly I, individually, conceive it to be, severe criticism must be converted into praise for ingenuity when we find practical benefit resulting from the original idea. There is a kind of hernia so large, that a very great proportion of the bowels have gradually dropt down into it; and the belly with difficulty receives the returned contents of the herniary sac; and when returned, they cannot be retained. In this case, to open the sac is in a manner to lay open the belly itself; and when by indigestible food and flatus, or congestion of any kind, or by the falling down of a new portion of the gut, a stricture takes place, where perhaps there is also an adhesion betwixt the gut and sac; then has it been found that to cut the bands of the tendon that embraces the neck of the sac, affords

a relief to the contents of the sac. The stricture is taken off, and it is better to have an increase of the hernia than to endeavour to return the contents into the belly when they cannot be retained, or to lay open the sac, into which the gut will fall down again and again, notwithstanding your utmost care.

Should it ever be proved that the inflammation which destroys the patient spreads from the cutting of the peritoneum, my reader may gather from the introduction how very differently I would explain the fact. But I have never seen an appearance on dissection which could give any foundation for the idea that the inflammation spread from the cut, or that it proceeded from the admission of air. According to my recollection, in every case, the intestine adhered behind the ring in such a way as to preclude the passing of air into the belly, (if it were possible that it could in the natural state of the bowels,) and to stop inflammation, if it were spreading, from the wound over the belly. I believe, then, that patients die after the operation for hernia in consequence of inflammation already begun in the bowels previous to operation.

The diligent student could not employ his time more profitably, than reading the authors on this important subject of hernia, and, considering it historically, give to each his mead of praise for novelty and ingenuity. He may commence with Dionis, la Faye, M. le Drans, who very well explain the circumstance of strangulation by the neck of the sac, "Sacs à Collets."

All incisions of the neck of the herniary sac are to be made directly upwards. This is the manner which the mere convenience would point out; and when we consider the thing more deeply, we find that the epigastric artery may be cut by too adventurous an incision, either inwards or outwards.

The epigastric artery mounts in general on the back and inner side of the neck of the sac; and even when in this more common relation to the hernia, by too long an incision it may be cut, as I have seen happen. But sometimes (as when the hernia comes down nearer the pubes,) the epigastric artery rises on the outside of the sac, and turns round it to rise upon the belly; so that if we cut freely outwardly and upward, we must open it there.

Notwithstanding these apparent difficulties, in regard to the course of the epigastric artery, little mischief has resulted in the operation. The danger, however, is still so far a possibility, that it leaves an unpleasant impression on the surgeon's mind during operation. There is scarcely a possibility of our cutting this artery, if the bistory is raised like a lever on the finger, so as to cut only what strongly resists, not the softer and yielding parts. I believe the epigastric artery has been cut, when surgeons have mistaken the cause of the difficulty in returning the gut, and have cut to a much greater extent than was necessary.

I have seen this artery cut fairly across, and yet very little blood escaped, which I could not account for. Mr. Sharpe supposed it easy to take it

up with the needle, if cut. I imagine it possible to take it up with the forceps, or tenaculum. Mr. Hey found it impracticable, and was obliged to stop it with graduated compress of sponges, over a dossil of lint.

MORE PARTICULARLY OF WHAT RELATES TO THE INTESTINE.

The intestine is to be gently and uniformly pressed, by grasping it with the palm and fingers of one hand. Being empty of flatus, the last portion of the gut which came out is to be replaced by the alternate pressure of the two fore-fingers; taking care that in trying to accelerate the entire reduction, we do not push the finger too forcibly into the opening of the tendon, while carrying the gut before it, lest the inner coats of the gut, which are very tender, be injured. When a portion of the intestine has been long incarcerated, and yet is not strangulated or deprived of its circulation, it is apt to form adhesions. It is evident that the strangulated gut, when deprived of circulation, cannot adhere to the sac; but while the intestine included in the sac is passing rapidly to gangrene, the part embraced by the neck of the sac adheres to the peritoneum. This, in one instance in operation, I separated with my finger. To apply the knife in this case, I conceive is out of the question. Were the tendons and peritoneum to be cut up for some inches, and the belly exposed, it would be a hazardous dissection to separate the gut with

the edge of the knife. If these adhesions are new, they may be separated by the finger; if confirmed, it is better, I think, to undo the stricture, and bring the integuments over the intestine in the best manner we are able.

In my Collection there is a fine specimen of the strangulation by a cord of adhesion within the ring, the intestine is cut through by the cord. I have also a specimen of firm ligamentous band formed by the omentum adhering to the mouth of the sac, very firm and similar to the strings of adhesion which have so often caused strangulation, independent of the neck of the sac, and indeed after it has been thought that the hernia was reduced.

My friend, Mr. Lynn, had a case in which, after reducing the gut, the symptoms did not remit, and the patient died of the usual signs of strangulation. On dissection, it was discovered that the gut had been passed round a cord within the belly. Sometimes such circumstances may be detected, by introducing the finger after the reduction of the gut*. There is a cause of obstruction in the canal after operation, very different from this, but as formidable; it is, when the portion which has been strangulated remains incapable of action.

* Very generally, if I am to judge from dissection, the gut adheres to the peritoneum behind the ring. I even suspect that this adhesion of the intestine is, in some cases, a cause of continued obstruction, after the reduction.

COLOUR OF THE STRANGULATED INTESTINE.—I have seen the intestine obstinately incarcerated, by the effect of over-distention, with flatus, and the coats of their natural transparency and colour. But in general the portion of intestine which is included in a stricture, is of a dark red, approaching to a brown colour, and the substance of the coats much thickened by infiltration into their interstices ; so that they acquire a fleshy thickness.

The first stage of strangulation is exhibited in a dark red colour, with the veins turgid and distinct. The second is shewn by a darker brown, with somewhat of a purplish tint, and the disappearance of the blood vessels on the surface.

Mortification is distinguished by a more lurid brown colour, and no fluid blood appearing when the surface is touched with the lancet. It is confirmed when dark spots of a bluish green are seen upon it, and when the surface is rough and soft.

Were I entirely to trust my own experience, I should say, we could not return a piece of gut into the abdomen, which was unfit to be returned. For there are adhesions formed within and at the mouth of the sac, at the same time that the intestine is proceeding to gangrene in the hernia itself.

I doubt whether the occasion for cutting away an entire circle of the intestine, and the possibility of reducing the ends of the intestine when they have been cut, will even occur. When, in operation, I have found a gangrened intestine, it has been

bursten, and air and fæces have escaped ; and the adhesions to the neck of the sac and to the peritoneum, near the mouth of the sac, I have found to be at the same time complete. In such cases, instead of cutting away the portion of the mortified gut, and attempting to unite the extremities, we should do better to treat more simply. The stricture being undone, I would be inclined to let the intestine remain in the sac.

If it should unfortunately happen that an accidental cut is made in the intestine, a free discharge of the contents of the upper part of the canal should be allowed before any attempt is made to unite the wound ; because no quiescence can be expected in the portion of the gut wounded, until the accumulated contents of the upper portion of the intestines have passed it, or are evacuated. If in any way it be required to unite the wound of the intestine, let it be done neatly with the interrupted suture, and the portion of the intestine reduced into the abdomen. If, in consequence of a gangrened intestine an anus at the groin is formed, it entails a most unconformable existence. It has happened that from the fortunate circumstance of the *diverticulum ilii* being in the sac, the patient has perfectly recovered notwithstanding the mortification of the intestine. But I believe it has also happened, that, after the sloughing has taken place, by the close union of the portions of the intestine, they have communicated by ulceration, and restored the food to its natural course ; and I conceive it practicable to ensure the

formation of this communication in the event of a portion of gut sloughing off in the herniary sac.

OF THE OMENTUM.

The epiplocele is troublesome and full of danger, though not so immediately dangerous as the intestinal hernia; but still, from the exposure of the tumour to blows, and the omentum being the precursor to the falling down of the intestine, it is a disease requiring much attention.

The truss for this kind of hernia must be used with precaution, for if the omentum be not kept entirely up, by pressing upon it, inflammation may be occasioned. Upon its first descent, this hernia is often attended with pain in the abdomen; and then it greatly resembles a strangulated intestinal hernia. But if the patient can retain light food and purgative medicines upon his stomach, there is usually no necessity for performing an operation.

In the symptoms of omental hernia, there is this distinction from the intestinal, that stools can be procured. The hiccups, too, are less violent and constant; the pulse somewhat fuller; the belly not so tense; and the disease has a longer course. To the feeling there is an inequality in the tumour.

When the stricture of the omentum proceeds to great lengths, then the tumour inflames, and proceeds through the stages to suppuration; while the inflammation runs retrograde upon the omentum, within the belly.

The omentum contained within a herniary sac changes remarkably from its natural state. It concretes into a mass; its lobes become large; it is loaded with fat; and strings of adhesion connect the several masses; or it forms a round, smooth ball, by its condensation, having only a connection with the omentum within the belly by a narrow, somewhat tendinous neck. My preparations assure me of the truth of Pott's remark;—"All that part which passes through what is called the neck of the sac is by constant pressure formed into a hard, firm, incompressible, kind of body, incapable of being expanded, and taking the form of the passage in which it is confined, exactly filling that passage, and rendering it impossible to push up the loose part of it which fills the scrotum."

When the omentum in a natural state escapes from the belly, in consequence of a wound, I have seen it impossible to reduce it, because of its extreme delicacy; and having been torn and mashed in the attempt, it was found necessary to cut it off. Mr. Hey, I see, thinks it possible, "that when the omentum is in a state tending to gangrene, though not appearing unsound, it may suffer irreparably from a degree of pressure in the reduction, which would not have injured it had it been perfectly sound."*

We have many occasions, then, for cutting off the greater part of the omentum, in consequence

* Mr. Hey and Mr. Warner describe a particular crossness or brittleness, as affording a more distinguishing mark of unsoundness than the lividity of the omentum.

of this consolidation and growing together; (sometimes it becomes like schirrus;) from adhesions to the sac or in consequence of gangrene. Preparatory to cutting the omentum, we must spread it fairly out, and unravel it, to see that no portion of the intestine be included in it. The remaining edge of the omentum bleeds proportionately to the quantity cut off; so that, to prevent a coagulum of blood being lodged in the belly, we must either include the whole mass of the omentum in a ligature, or take the vessels up with the tenaculum. The latter method is to be preferred; for the tying of the end of the omentum is but substituting a ligature for the stricture of the omentum; so that restlessness, anxiety, and fever; pain of the belly; nausea and vomiting occur; in short, peritoneal inflammation, and death, may follow this.

I have certainly seen a ligature put about the whole process without a wrong symptom; but it was done in the natural state of the membrane, when being soft and yielding, the ligature came away on the second day. A ligature remaining about a firm tendinous mass of omentum, I should imagine to be a cause of great alarm and danger. If it be required to cut the omentum, the intestine should be first reduced, that the circulation in the membrane may be perfectly free, before it be reduced. Let care be taken also that it do not slip up into the belly before the blood be stopt.

If the omentum be entirely dead and gangrened, it were perhaps as well to look that no stricture remains upon it, and to take the greater mass only

away, and leave part of it to remain, which will afterwards cast off. But if it be in part diseased, in part destroyed, if left it will grow into a fleshy irregular mass, requiring afterwards to be extirpated.

TREATMENT OF THE PATIENT.

The integuments are to be brought together and supported by adhesive straps. Above this a soft compress of lint and of old linen is placed, and the whole secured by a roller passed as a spica bandage. Let the patient apply his hand on the dressings when inclined to cough, or when he wishes to have his bed or clothes shifted, to move in any way, and especially on going to stool.

OF FEMORAL HERNIA.

Whoever, says Mr. Pott, examines the tendon of the external oblique muscle, "will find that the part of it which runs obliquely down from the spine of the os ilium towards the symphisis of the os pubis, is tucked down and folded inwards as it were." Any one looking to the dissected body, and recollecting this introductory sentence of Mr. Pott, will readily comprehend the whole truth, so as to anticipate the novelties of the present day. The cord lies in a groove, or gutter-like canal, formed of the lower part of the abdominal tendon, which is inserted broad and horizontally into the os

pubis, having two margins, one which is tucked down by the fascia of the thigh, the other internal, and the actual termination of the tendon. But discoveries of ligaments or fasciæ have been made within these few years. They are not discoveries in anatomy ; but, at most, the application of circumstances of the anatomy to surgery. Accustomed to direct the knife of the student at a very early period of my life, I may without much assurance, say, that the detail of this matter in my Dissections, p. 111., comprehends the whole anatomy. But I thought I was writing what every one knew. The true anatomy is very distinctly represented in plate xiii. A, B, C, System of Dissections ; both in as much as regards the tucking down of the round edge of the tendon, by the fascia of the thigh, the broad insertion of the tendon into the os pubis, and the acute internal margin of the ligament. See again this ligament raised, in additional plates i. and ii.

Further, in my remarks on the additional plate of the muscles of the abdomen, in speaking of Gimbernat, Append. p. 5., I have said, the opinion that it is not on the external margin of the ligament that the tension in hernia was found, but more internally, under the ligament, and towards the pubis, is no conceit, (as I had then heard it spoken of,) but resulting from the natural state of the parts.

To say, however, that the inner margin of the tendon of the external oblique is always, or even

most frequently, the place of strangulation, I conceive to be an error; for it is the sudden angle which the dilated gut makes with its straightened part in the neck of the sac, that causes the strangulation; in other words, as the gut and sac rise from the hollow in the top of the thigh, on the fore-part of the tendon of the abdominal muscle, that which produces the acuteness of the turn, (the outer margin of the ligament, where it has thrown off its two circular fasciæ,) is the part at which the strangulation is seated, for the most part.

We know that the lower part of the tendon of the external oblique muscle is tied down by the fascia of the thigh; but we know also that the herniary tumour is in truth under a fascia, which is at this place more like the common cellular substance, having thickness from the quantity of fat, and firmness from an intermixture of tendinous filaments.

Fasciæ not only go upwards, on the inside of the abdominal muscles, and on the iliacus internus, as described by Mr. Cooper, but two thin and strong ligaments or fasciæ pass down, the one over the hip-joint, and the other over the os pubis; and these really convert the opening under the Poupart's ligament into an arch; and betwixt these two tendinous membranes, the femoral hernia descends, and is strangulated.

A, The femoral artery. B, the femoral ligament. C, the ligament of the womb, coming out from the ring. D, an undescribed fascia, which goes down to the bone, and is continued over the joint. E, another ligament on the inside of the space through which the femoral hernia descends.

I conceive that this arch on the inside of the femoral vessels, is the place where the stricture is most frequently found, and round which the neck of the sac turning, the intestine is strangulated.

The femoral hernia cannot force its way downward. Sometimes remaining small, it lurks in the groin, and is strangulated before it forms any considerable tumour ; but oftener it is forced up from the hollow, and rises somewhat, so that I have often seen it mistaken for inguinal hernia.

Taxis.—Knowing the nature of the tendon under which this hernia passes, we see why there should be a different intention in the exertion we use in this case, from that which we

propose in the operation for inguinal hernia; for while we relax the fascia of the thigh, and the abdominal muscles, we must press the tumour down into the hollow, before we attempt to return it under the ligament. To press it directly into the belly, or to force it upward, is to push the tumour from the direction in which it must pass, to be reduced.

The tumour has twice presented to me, during operation, in a very puzzling form. I was operating in the hospital of Edinburgh, in the night; the tumour might be said to rise under the knife, (since the more it is dissected the fuller it expands, and the more freely it rises from the depth of its situation,) and in this case it presented with a knobby irregularity, and quite destitute of elasticity. My assistants conceived that I had got entangled with a set of diseased glands; but dissecting towards the passage, from under the ligament, I felt confident that I was right, since I traced the neck of the tumour from under the ligament. It was an omental hernia chiefly, having within it a small portion of the intestine. The condensed omentum gave it a firmness, and the sac was studded on the outer surface with the enlarged glands of the groin.

On another occasion, in assisting a friend in operating upon a lady, the tumour had a very irregular and knobby form. I should have supposed that the irregularity proceeded from the glands; but on pressing these knobs, they were elastic and

full of fluid. They proved to be vesicles or hydatids attached to the surface of the herniary sac.

We are reduced then to form our diagnosis from the precise place of the tumour, and from the manner in which it rises, from under the ligament. This may be felt when the parts are not strangulated. When strangulation and inflammation have taken place, and the surrounding cellular membrane is full, if the feeling be less distinct, the symptoms of obstruction are more marked.

OPERATION FOR FEMORAL HERNIA.

The first incision may pass obliquely from above, inward, passing over the tumour in its length, if it be oblong ; reaching a little further than the base of the tumour in both extremities, and proportioned to the thickness of the integuments and size of the tumour.

Having disentangled the tumour from the binding of the general fascia of the thigh, we proceed as in the bubonocele, lifting the lamina of membrane with the point of the knife, and pushing the directory under them ; at least one complete membrane, besides the proper peritoneal sac, invests the tumour.

The surgeon may find himself much perplexed in this very nice piece of dissection if he does not make the lower edge of Poupart's ligament and the connected fascia quite distinct. And let it be observed that he will do this more easily now, and

with more safety than when the sac is opened, and the intestine rising covers the parts.

Certainly Mr. Pott was incorrect in saying that the femoral hernia is less subject to strangulation than the inguinal. The hernia is often small and runs a rapid course ; and as to his opinion, that it may be reduced without cutting the femoral ligament, I believe this is equally incorrect in the general run of cases. I have always found the stricture particularly tight in this kind of hernia.

But in this stage of the operation, we have to recollect the manner in which the tendon of the muscle of the belly is bound down by these fasciæ, which I have described ; and we have to wish that the stricture may be here, as I believe it generally is. Because, if the stricture be on the outer margin of the ligament of the thigh, though it be cut freely, yet the guard against future descent is not weakened ; whereas if the stricture be found on the inner margin, and this edge be required to be cut up, it must weaken the guard of the tendon, at a place where there is a perpetual effort made to protrude the bowels.

Having opened the sac, then, with the precautions used in the inguinal hernia, we feel with the finger within the sac, for the cause of strangulation, and finding it in the outer margin, endeavour to raise the sac and ligament on the point of the finger, and with the point of the scalpel, to scratch upward from the finger, so as to cut across these firm, tendinous cords.

Now finding that the finger can be introduced, we may feel a stricture within; but from the circumstance which I have already explained, this tightness, though considerable, may not be the cause of strangulation; and by gentle effort, the intestine may be withdrawn a little, and emptied without further incision, and then be reduced.

But let us not conceal the possibility that this internal edge of the ligament of the thigh may be the sole or principal cause of strangulation; and that in that case it must be cut. It is a firm tendon, unlike the cause of the internal stricture of the bubonocele. If it be distinctly felt, cord-like, and running across the neck of the sac, the sac need not be cut, but the directory put over the neck of the sac, and the bistory carried along the directory, until the probe-point is just beyond the margin of the ligament; when by gently depressing the handle of the instrument, the edge near the point rises upon the ligament so as to cut it.

If no more of the ligament be cut than is absolutely necessary, there will be no danger to the epigastric artery or the spermatic cord. Still we should recollect how very near these parts lie to the edge of the knife. This being the situation of the parts—

In this plan, (which, it is to be observed, is a mere plan, and not the representation of the tendon and its fasciæ,) A, is the hernia. B, the spermatic cord. C, the course of the spermatic cord, marked by dotted lines above the ligament. D, the course of the epigastric artery ; so that E is the course of the incision ; and that it must be straight upwards is evident ; neither inclining inward, for we will cut the cord ; nor outwards, where the epigastric artery is before the knife.

The reduction of the gut, the circumstances regarding the omentum, the dressing, and the precautions after the operation, are the same in this case as in the operation for bubonocele.

OF THE UMBILICAL HERNIA.

The umbilical hernia is very seldom strangulated. If, however, it should, and the gut be

included, making it an urgent case, then the young surgeon should be aware of the difficulty of keeping the parts reduced, when the whole tumour has been laid open, and the parts pushed back. The opening of the umbilical hernia is generally very wide, and compression is with difficulty applied to a soft and yielding part, like the fore-part of the belly, and which is naturally protruded and retracted with every respiration.

I have known the operation performed, and the omentum and intestines freely opposed as in a bubonocele, but when the operators came to the reduction and retention of the bowels, their dismay may be conceived, when they had to appearance laid open the woman's belly and exposed the viscera without the means of reducing them, or even of making a decent appearance at the close of the operation.

We ought not to draw the knife over the face of the tumour, so as to lay it open; but only make an incision on one side of the base. Then, with the same precautions of dissecting off the outer lamina, endeavour to get within the margin of the tendon, which being cut by the probe-pointed bistory, the hernia may be reduced, or the last portion of the intestines, which has perhaps fallen into the interstices of the old contents, may be returned. If, upon cutting the margin of the tendon, the neck of the sac does not so dilate as to relieve the contents, that part of the sac embraced by the stricture may also be cut, so as to admit the finger.

By this operation, the terrible consequence of having a portion of the bowels among the hands, which cannot be reduced, may be avoided.

I conceive there is a peculiar character of the umbilical hernia ;—there is often a predisposition to the disease from the great width of the opening. For this reason, and from the opening being direct, as well as free, it is less subject to strangulation than the other kinds of rupture. Being generally of long standing, and often containing much omentum, (from its situation high in the belly,) the sac and contents adhere ; the sac becomes in places thin, and is even sometimes entirely absorbed, so that the omentum and common external fat adhere, and the intestine being immersed in a mass of condensed and adhering omentum, it is sometimes confined and strangulated there.

SECTION VI.

OF THE HYDROCELE.

HYDROCELE is a term appropriated to the tumor occasioned by water, collecting in the coats of the testicle. The true hydrocele is a collection of water within the tunica vaginalis. The hydrocele of the cord is occasioned by an effusion into the cellular membrane of the spermatic cord. The "*Hydrocele par infiltration*," is nothing more than an anasarcous swelling of the scrotum ; it is essentially different as a disease, because it is not depending upon the state of the testicle like the others, but on some constitutional weakness, or, as in infants at birth, proceeding from position merely. I shall treat first of the hydrocele of the tunica vaginalis.

The hydrocele begins in a tense and general swelling, apparently of the testicle : sometimes succeeding accidental inflammation, (as from a blow, or a bruise on the saddle,) which has subsided, and which has been followed by relaxation and weakness. Most generally the patient can give no account of its cause or origin, but that the

swelling of the testicle remained small for a considerable time but of late it has more rapidly enlarged.

As the swelling enlarges, it rises with somewhat of a pyramidal form, before the vessels of the cord.

This peculiar shape of the distended tunica vaginalis, is not owing to the opening of its original communication with the peritoneum, (which soon after the descent of the testicle is obliterated, and degenerates or is changed into the appearance of the common or cellular membrane,) but to the distended coat being embraced by the fibres of the cremaster muscle, and connected by cellular membrane to the cord. To the touch, the tumour generally feels elastic in a slight degree, and though sometimes hard and incompressible, yet it wants the weight and solidity of the diseased testicle. In some cases it is soft and lax, and occasionally I have found the tenseness of the tumour change considerably; which was no doubt owing to the variation in the action of the absorbents.

Towards the back and lower part of the tumour, the more solid resistance points out to us the seat of the testicle.

The hydrocele of the tunica vaginalis is for the most part in a slight degree transparent. To ascertain this, we grasp the scrotum in the hand, and gather the scrotum behind in such a way as to smooth the rugæ; then placing the other hand over the tumour, so as to direct the strong light

through it, we may discern a slight degree of transparency. In children, the transparency is particularly observable.

We next examine the state of the spermatic cord. The vessels of the cord will in general be felt distinctly betwixt the top of the tumour and the abdominal ring. When this is the case, we are relieved from the fear of a hernia; and it remains for us only to determine whether it may not be an elastic tumour of the body of the testicle.

When the apex of the hydrocele extends up into the ring, then we must ascertain the nature of the complaint by other tests. 1. By the history. The hernia begins above and descends; the hydrocele in the bottom of the scrotum, and ascends gradually. This is a circumstance which the patient will be enabled to determine. 2. We may now place the patient on his back, and grasping the tumour, we shall find that position and pressure makes no change upon it. The patient being raised again, is made to cough; and if there is now no impulse upon the tumour, from the shock given to the general cavity of the belly, the symptoms of hernia are not present. It is therefore evident, that it is not a hernia, but a disease of the testicle.

There is a greater difficulty of distingushing hydrocele from the soft enlargement of the testicle. I have twice dissected testicles which had been pierced for hydrocele, and found them to consist of a peculiar vascular, dark, and bloody structure, as if consisting chiefly of varicose veins, which distended the coats with an elasticity so like that of

a fluid, that knowing the tumour not to be a hydrocele, I could not yet distinguish any peculiarity in the touch and feeling, by which I might in future determine its nature. A grey pulpy matter is forced out from the puncture, when the surgeon has mistaken what is called the scrofulous testicle for a hydrocele.

In schirrus of the testicle there is often water collected betwixt the coats, which may to the unexperienced touch give the feeling of hydrocele. The weight ; the pain occasioned by handling it ; the slight degree of inequality ; the varicose state of the vessels of the surface,—distinguish schirrus. And by continuing the pressure of the finger, you will often be able in displacing the water, to feel the enlarged body of the testicle.

With hydrocele there is often an enlargement of the testicle, and a thickening of the coats. But sometimes, on the contrary, there is relaxation of the cord and of the coats, and a softness and diminution of the body of the testicle.

There is an observation which I believe quite correct : the apparent schirrosity which often accompanies hydroceles of long standing, is nothing more than a thickness of the coats of the testicle, from long distention, and an enlargement of the gland itself from pressure, which being removed, the parts become thinner, softer, and gradually assume nearly their natural state.

So far I have stated the circumstances regarding hydrocele, which are observable by the examination of the tumour : but there is a principle, which

is to direct our practice in this disease, which must be drawn from a more narrow observation of the structure and function of the parts. If we make a careful examination of the sympathies which govern the natural actions, we shall comprehend the course of diseased influence. The urethra stands in a relation to two very different sets of organs, and ministers to two distinct functions. The sensibility of certain parts of the urinary canal, differ more in kind, than in degree. The small elevated body which, at the neck of the bladder, controuls the motions of the bladder, possesses a different sensibility from the seminal, caruncle, or caput gallinaginis; the latter controuls the operation of the testicle. Disease in the urethra will sometimes affect the urinary organs, sometimes the seminal organs. But the latter are more familiarly known, the signs of disorder in the urinary organs are more evident; while the effect of disorder in the urethra, upon the testicle is more obscurely marked, and consequently much less attended to.

The more common occurrence of inflammation, propagated from the urethra to the testicle in the instance of hernia humoralis, demonstrates very distinctly how the state of the urethra may influence that gland. A lower degree of chronic inflammation about the verumontanum, will cause a derangement of the vascular action in the membranes of the testicle, a thickening and irregularity in them, and an effusion of water betwixt the coats. This connection, so evidently established, betwixt the urethra, and cord, and testicle, must

not be neglected, especially when you find a complaint in that gland which is not to be traced to a connection with some prevailing disposition of the system, or from some direct injury upon it.

The PALLIATIVE CURE, as it is called, is the mere evacuation of the water of the hydrocele, by means, of the trocar. But as the evacuation and suspension of the testicle is the whole of this operation, the description of it is of course included in that of the more perfect cure by injection. But from what has been delivered, the necessity of examining the urethra is apparent. If, on passing a bougie, there is morbid irritability and pain excited, as the bougie touches the mouths of the seminal vessels; then, certainly this state of the urethra is to be removed, for it is probably the cause of the disturbance of the testicle and of the hydrocele.

OF THE CURE BY INJECTION.

THE intention of this operation is to excite such a degree of inflammation in the surface of the tunica albuginea, and tunica vaginalis, that being left in contact by the evacuation of the fluid, they may adhere and preclude the possibility of all future exudations. This at least is the opinion I have formed from finding the tunica vaginalis and tunica albuginea adhering upon dissection of those who have suffered the operation by injection. Some imagine that the effect is only to correct the disposition of secreting surfaces, and that adhesion does not follow this operation.

INSTRUMENTS.

The apparatus for injecting the hydrocele consists of a lancet, trocar, probe, and syringe or gum bottle; wine and warm water, mixed; three parts of wine to one of water. I have only to notice that I have found the common bladder preferable to the elastic bag, as much less apt to inject air instead of the fluid.

OPERATION.

The patient should be placed on the side of the bed, with his hips and back so supported that any involuntary start may not have the effect of making him shrink from the puncture. Or let him be placed on a chair, and by pillows prevented from retreating with a sudden jerk, which may cause the instrument to slip out after puncturing the sac, and oblige the surgeon to defer the latter part of the operation.

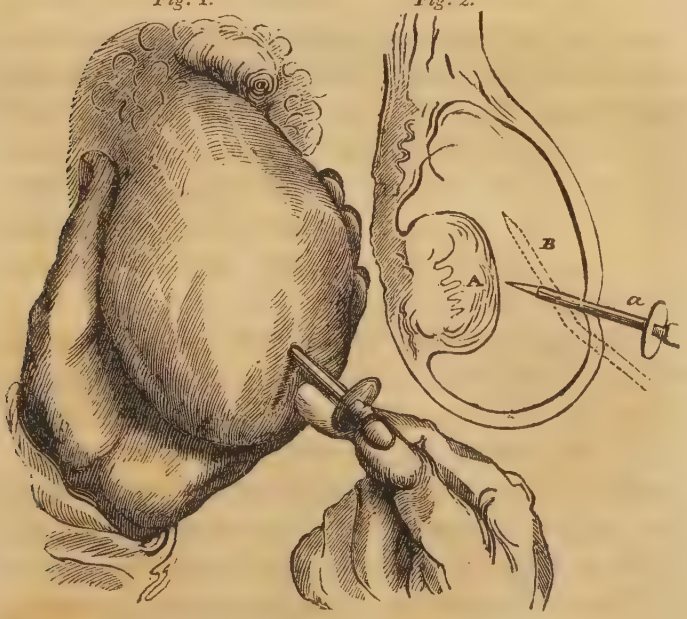
If the tumour be equable and smooth, and the scrotum and coats of the testicle thin, and the nature of the case quite decided, we at once introduce the trocar. If the integuments are strong and thick, and the tumour small, I would advise the surgeon to puncture the scrotum, or rather to make a small incision into it with the point of a lancet, in order to expose the tunica vaginalis; and then to introduce the trocar and canula.*

* If there be difficulty in the case; if the state of the testicle be suspicious; if the hydrocele be complicated with hernia,—then we should

In making the puncture, the whole scrotum should be grasped in the hand, and the fore-finger and thumb brought round in such a manner as to grasp the neck or upper part of the tumour, fig. 1. The lower part is in this way more distended, and the forepart of the sac removed from the surface of the testicle. You now introduce the trocar and canula (but without plunging it) into the inferior and fore part of the tumour.

This plan, fig. 2, however, will shew that we must not pierce directly inward; but having entered

Fig. 1. *Fig.* 2.



cut the scrotum with the point of a lancet, and puncture the sac, introducing a common probe, to facilitate the escape of the fluid, and enable us to examine the testicle by the touch.

the sac, carry the point a little upward in the direction of the outline B, so as to avoid the surface of the testicle A, and pass into the upper space of the hydrocele.

Further, if, as sometimes happens, the head of the stilette (*a*) is larger than the canula, it is apt to pierce with a jerk deeper than the surgeon intended, because it may take some force to pierce the vaginal coat in its thickened state. To avoid this, the instrument may be held as is represented in the first plan, where it is made to rest against the fore-finger, in introducing it; and is moved by the ball of the thumb along the fore-finger, at the same time that it pierces the scrotum.

If the hydrocele is small, and it does not appear that the instrument can be far within the sac, (perhaps the canula has just pierced it,) then, instead of withdrawing the stilette, with a motion of the thumb, the canula is pushed forward, further into the sac, whilst the stilette is at the same time withdrawn.

Having withdrawn the stilette, and allowed the water to flow, we have to knead the sac gently, and raise the lower part of it, so as to evacuate the whole fluid.

Here the operation terminates as a palliative remedy.

But if it be intended to inject the hydrocele, we need not be particular in evacuating the last drop, as in doing this there is danger of displacing the end of the canula. We should rather, in that case, be careful to feel that the extremity of the

canula is retained within the sac, while we examine the state of the testicle. Though the testicle be somewhat enlarged, this is common to the disease, and we proceed; but if large, hard, irregular, and painful, we may withdraw the canula; for the wine and water should not be injected in these circumstances.

The assistant ought to bring the injection bag, and support it, so that the surgeon may have only to turn the nosle of it into the canula, without moving his left hand. He now slowly compresses the bag; fills the sac till it rises nearly to its former size; he then turns the stop-cock.

Let it be observed, that air being in the bag or syringe it is thrown into the hydrocele, and as the air in that case remains uppermost, the upper part of the sac does not receive the full influence of the injection, and the water collects there again, even if adhesion should take place at the lower part.

The injection should remain from two minutes and a half to five minutes; unless we are warned by the sensations of the patient to abridge the operation. Severe pain in the cord and loins, with faintness, betrays a degree of sensibility in the membranes, which will be excited to inflammation by a slighter stimulus. The injection is returned much changed in colour, and very turbid.

The most serious accident which can happen from the operation, is the injection of the stimulating fluids into the cellular substance. This is an accident which I have seen very frequently

happen, even in the hands of dexterous surgeons.*

I think that I have ascertained in two instances, that this proceeded from the defective form of the instrument. In injecting the fluid, the end of the canula was pressed upon the surface of the testicle, in consequence of which the slit and small hole in the canula which had not passed into the cavity of the sac, giving a passage to the injection, it filled the cellular membrane. On this account, and from the ease with which it enters, and the firmness with which it remains in the vaginal coat, when the stilette has been withdrawn, I have little hesitation in preferring the old circular form of the canula, with the triangular pointed stilette, to any of the more recent inventions.

When the fluid has got into the cellular membrane, I have seen very high inflammation of the scrotum, with fever, and violent pain in the course of the cord, and in the loins, followed by suppuration and bursting of the scrotum, and a dripping discharge of serum with curdy flakes. This accident may happen in a slight degree to the most expert operator. But he is much to blame if he be

* One day while I was accompanying a celebrated surgeon to the house of a patient, on whom he was about to perform this operation, I took occasion to remark to him this danger. He said that he could not conceive how it should happen, and that he had performed the operation thirty times without such an accident having occurred. But in performing the operation that day the very thing happened: a large proportion of the fluid got into the cellular membrane. I had not therefore to convince him that it was possible, but only to shew him how it happened.

not aware of the danger, and if he do not see what is about to happen, and desist in time. Besides, he should puncture the part, and endeavour by gentle pressure to relieve it, and take precautions against the rising inflammation.

But Sir James Earle tells us of a case in which the surgeon had allowed the trocar to slip from the sac, and still continued to force the injection notwithstanding the resistance he felt to its entrance. The consequence was, that he filled the scrotum of both sides! Violent inflammation and mortification, and slough of the scrotum, followed, and left the testicles bare.

The marks of the due degree of inflammation having taken place, is a general swelling of the testicle, and a slight redness of the scrotum, on the second and third day. The tumour feels as if the disease had rapidly returned, and the coats had filled with fluid. As the inflammation rises, a pain shoots into the back and loins. Generally to the fifth day the scrotum is swelled and tender, but sometimes it is free of pain; and I have seen it remain swelled a fortnight. After this period, the inflammation subsides, the tumour becomes softer, and dissipates, and the testicle is again felt.

If an operation for hydrocele has failed, I believe it will be found that the water accumulates in a very short time; and that, on the contrary, if the scrotum continues undistended for three weeks, the cure is confirmed.

After the operation, we confine the patient to his room only. If the inflammation slowly advances, it may be promoted by allowing somewhat more freedom in air and diet. If it comes on rapidly, and threatens a greater degree of swelling and pain than necessary, then he must be put to bed, kept on a regimen, and have the parts fomented.

MR. POTT'S OPERATION OF THE SETON.

Before the practice was introduced of injecting the hydrocele, the operation of the seton, as performed by Mr. Pott, was a most valuable remedy. It was thus performed.

The vaginal coat was punctured, and the water drawn off. Through the canula of the trocar a smaller and a longer canula was introduced, and the first withdrawn. This second canula was now pushed to the upper part of the empty sac, and held there; and through it a round needle, with a sharp point, about two inches longer than the canula, was introduced, and pushed out through the integuments, carrying a seton of white silk thread.

In fig. 1, the long canula, A, has been introduced through the canula of the trocar, which latter was then withdrawn. The long canula is then introduced to the point B ; then the stilette C is introduced, and pushed through the integuments at B, and the seton is drawn through the canula, and of course without rubbing on the surface of the testicle.

On the second day from this operation, the scrotum is swelled and inflamed. The inflammation goes too high, and must often be reduced by fomentation,—by laxatives and regimen. When the inflammation has arisen to the due extent, and is decreasing, (viz. about the twelfth day,) the threads of the seton are successively withdrawn.

A priori, I should have said that this was the best of all the operations for hydrocele; the neatest, the easiest and the most manageable. But I have had no experience of it; and modern authority is entirely in favour of the cure by injection.

OF THE OPERATION BY INCISION.

The only apparatus necessary, is a scalpel and bistory, the common pocket case of instruments, a little lint and oil.

The patient is seated on a firm table. Bringing him to the edge of the table, you grasp the scrotum behind, making the fore part tense, and beginning near the upper part of the tumour, the knife is drawn to the bottom of the scrotum, cutting the integuments and exposing the vaginal coat, touching the upper part of the incision again with the edge of the knife, until the sac be quite exposed, and the cellular membrane retracted, you puncture it with the knife; introducing the fore finger, you run down the bistory or knife, so as to cut the vaginal coat down to the bottom of the scrotum. The finger is as a directory, and at the same time keeps back the testicle from the knife.*

The vessels do not require the ligature. A piece of lint soaked in fine oil is introduced betwixt the lips of the wound, and a corner pushed up to the

* In some cases, the vas deferens has taken its course on the fore part of the sac.

top of the sac, while a slip of dressing, with common cerate, is laid along the edges of the wound.

To the surgeon, the operation is easy; but to the patient severe, when compared with the complaint.

No further dressing is required than a general support to the scrotum.

To talk about removing parts of the sac, when diseased, or when it has lost its tone! is altogether out of the question. No such thing is necessary, unless the sac be ossified; a specimen of which I have in my Collection.

And as to the slipping out of the testicle from the scrotum, in consequence of this operation, I have never seen it, and can hardly imagine it. Nothing but the utmost degree of carelessness can occasion any bad consequence from this operation.

The dressings may be removed on the third day. When suppuration is established, the dressing is only insinuated betwixt the lips of the wound. In three weeks, the parts are whole.

This operation is not practised, owing to its severity, and the length of confinement necessary to the cure. But I see occasions when it will be preferable to the injection; for instance, where the injection has failed, where the fluid could not be entirely evacuated, owing to the irregularity of the sac, or the combination of the true hydrocele with incysted watery tumours; but this brings me to speak of the Hydrocele of the Cord.

HYDROCELE OF THE SPERMATIC CORD.

This is a disease of the cellular membrane which surrounds the spermatic vessels. A complaint, the nature of which is not always easily ascertained; for as the enlarged cells occupy the ring, they may be mistaken for varicose enlargement of the veins of the cord, or the sac of a hernia with a portion of omentum included in it.

To understand the nature of this complaint, we must observe that there is a certain kind or degree of inflammation which produces a cellular effusion, having a considerable resemblance to the true hydatids. The best parallel to the hydrocele of the cord is the lymphatic effusion, which marks the encreased excitement of the vessels of the choroid plexus. But a similar effusion into the cellular membrane will take place over a herniary sac, as I have found it in the instance of femoral hernia. This effusion into the cellular texture, in the neighbourhood of a diseased or inflamed part, is not of the nature of dropsy, in which case the fluid would be dissipated among the surrounding cells; here inflammation and condensation of the membrane precedes the effusion; and, instead of a series of cells communicating together, a number of distinct bags of fluid present themselves.

Now my reader will understand the distinction in the case of hydrocele of the cord, which is meant to be made by the term *hydrocele of the tunica communis*, and *incysted hydrocele of the cord*. They are degrees of the same affections.

When the cells communicate, and make a string along the cord, reaching into the belly through the ring, it is more difficult to mark the distinction betwixt this disease and varicose enlargement of the veins, or hernia ; because the tumours are like veins to the feeling, and because their fulness is diminished on the patient lying down.

When we have understood these watery tumours to be a consequence of inflammation in the parts beneath, or in the neighborhood, we can readily comprehend how they should form upon the vas deferens, which is so often inflamed ; and this hint points to the urethra as the source of the disease. In less urgent cases, attention must be paid to the urethra, and the low inflammation, which probably lurks about the verumontanum, is to be removed. The cure by injection has been recommended for this kind of hydrocele, very improperly.

The OPERATION should be simply this. Let an incision be made through the integuments so as to expose the vesicles. Let them then be opened individually. A piece of lint soaked in oil is to be placed betwixt the lips of the wound. The inflammation which rises consolidates the cellular texture, and destroys this disposition to form incysted tumours.

OF THE EXTIRPATION OF THE TESTICLE.

THE schirrous enlargement of the testicle, or that irregular hardness which precedes cancer,

and which requires extirpation, makes its attack on the body of the gland, and spreads and involves the epididymis. The hardness and the irregularity of the body of the testicle in this disease is quite peculiar. However, the irregularity is not always felt unless we press with some force; for at the same time that the testicle is diseased, there is a degree of hydrocele which fills up the inequalities of the surface of the testicle. The disease advancing, the peculiar darting, lancing pain of cancer, is superadded to that gravitating pain in the thigh and loins, which is the common effect of the enlargement of the testicle.

The glandular origin,—the stony hardness,—the imperceptible growth at first, with the lancing pain, form the most distinguishing character of schirrus. When the scrotum has ulcerated, and a fungus has sprung up, the character of the cancer is announced. The ulcer is irregular; there is erosion in the interstices of the excrescences, and bursting of the blood-vessels daily more and more weaken the patient.

To this extent, the progress of the disease may have been very gradual, but now it rapidly advances by contaminating the cord or fixing on the skin. There accompanies this disease a wan and leaden countenance, hectic fever, loss of appetite and flesh, and continual pains. I have in my Collection a testicle, which I saw extirpated, which, on the one side, exhibits the appearance of cancer; but on examining, the section behind the body of the testicle is only a little wasted. The surgeon

will be careful of affording more examples of this. He will recollect that whatever may have been the cause of irritation, when suppuration takes place in the body of the testicle, and the fine texture of the gland is exposed, that it often shoots out into an ugly fungus, although there may not be any thing malignant in the complaint.

In examining the disease of the testicle, with a view of judging of the propriety of extirpation, let the surgeon remember that principle of pathology, of which I have already spoken, the irritation which is sometimes propagated through the seminal vessel from the urethra. Let him also recollect that disease, once produced in the body or coats of the testicle, will propagate itself, and though not of a cancerous nature, will nevertheless assume all the character of it, and pull down the constitutional powers to a near resemblance to the complexion of the cancerous patient.

We have, as a previous step to any operation, to examine the progress of the disease towards the spermatic cord and the skin. If the cord be irregularly hard, and painful to the touch, the symptom is unfavourable, unless we have room above the diseased part to cut and tie the cord. If it be enlarged, irregular, thick, and painful in its whole extent, the operation should not be performed.

If the scrotum have entered into disease, it is nearly as unfavourable to the success of the operation, as the disease of the cord; for sometimes after amputation, the disease has recurred in the

skin; though more commonly it is the cord which propagates the disease. If the glands in the groin have enlarged, and partaken of the disease, the extirpation of the cancer is out of the question: it is impossible.

Before entering on the operation, let the question be not only regarding the true character of the disease, but also if every thing has been tried likely to give relief. Has the state of the urethra been attended to? Have leeches and fomentations been applied in assistance to the mercurial pill? Have leeches, blistering, and setons in the scrotum, with due attention to the state of the system, availed nothing?

OPERATION.

The instruments necessary for this operation, are scalpels, forceps, tenaculum, a large soft ligature for the cord in a needle, lesser ligatures for the artery of the cord and of the scrotum, lint, sponges, slips of adhesive plaster, compress, tow, suspensory bandage, or split T bandage.

Having examined the state of the testicle, cord, and scrotum; having determined that it is possible to cut above the disease of the cord; and determined what portion of skin it will be necessary to cut away, if the skin be diseased at all, the operator proceeds thus:

The patient is placed upon a table, with assistants holding aside the thighs. The surgeon sits before him.

There are two ways of doing this most simple operation ; and of those two ways, I must premise that the one I am going to describe, is objected to.

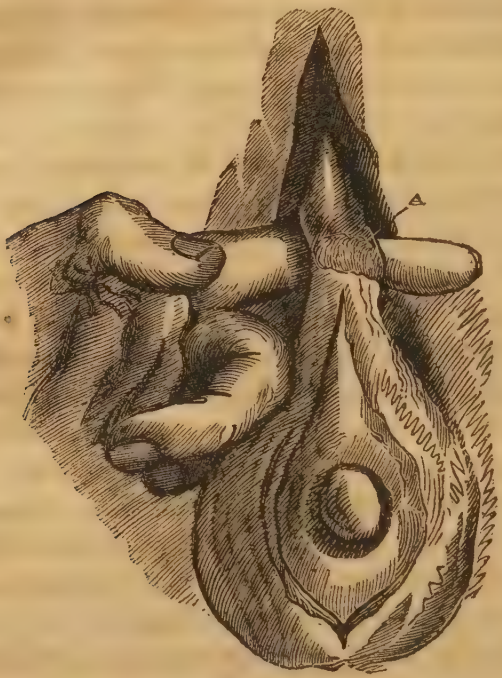
First cut down upon the sound part of the cord, and examine it well ; dissect and put aside the cellular membrane altogether, until the free and perfectly distinct tissue of vessels forming the cord, is seen. Above the place where you have laid bare the cord, and in the upper angle of your incision, apply, with a needle, a large soft ligature under the cord, including the cellular membrane around the cord. There let it remain, but do not tie it.

But if the disease of the cord has reached high, —if there seem any risk of a necessity for cutting the cord very close to the ring, then I would pierce, or rather divide the cord with a needle and double ligature, so that, if necessary, I might tie a ligature on either side of the cord.

Further, it is to be recollected that the size of the testicle, the activity of its vessels, or its weight merely, may have enlarged the cord considerably ; and this enlargement the surgeon must learn to distinguish from the progressive attack of the disease and the contamination of the cord from the disease of the testicle.

He ought besides to observe well any distended cells on the cord, and dissect them ; and run the probe to the bottom of them before he cuts the cord across. He must also be careful not to cut through a confused mass of condensed cellular

membrane ; it may prove to be a herniary sac, for this has actually happened.



Now taking the dissected part of the cord betwixt the finger and thumb, cut it across, as is here represented, but not at once. Cut into it, and as the vessels bleed, take them up with the forceps or tenaculum, on the surface A.

You command the bleeding with your finger and thumb ; and, holding up the cut surface of the cord, you pick out the extremity of the artery with the tenaculum or forceps ; and the assistant ties a neat small ligature around the artery. Then

giving freedom to the blood, without letting go the cord, you examine whether the artery of the *vas deferens* be enlarged, so as also to require a ligature; or whether any other arteries bleed. Having secured all the arteries, the cord is to be entirely cut through.

The incision being made in the whole length of the scrotum, and the cord cut through, the severe part of the operation is done; and now we have only to pull down the cord, and with a free dissection turn out the testicle.

If the testicle has been large, or the common inflammation active, the septum scroti will have adhered to the diseased testicle, and we shall have to cut a great part of it away with the testicle. This, of course, leaves the other testicle free, being connected only by its cellular substance, so that it must be held aside by the assistant, or it will fall forward from the protection of the scrotum.

A considerable artery will sometimes bleed from the loose texture of the septum, and require a ligature.

Objections have been made to the cutting of the cord before the testicle has been dissected. In one case of extirpation of the testicle, "after the operation was completed, and the wound dressed, the patient being seized with a fit of coughing, to the astonishment and dismay of the surgeon, the dressings were forced off by a protrusion of several convolutions of small intestines; from this it was proved that the patient had had a hernia: but the diseased enlargement of the tes-

ticle had acted as a truss, and prevented the rupture from coming down."

This surgeon must have been remiss in ascertaining the history of the disease. He must have cut the cord directly through, without examination. If he could not recognise the sac of a hernia, lying before the cord, would he have done it better by dissecting the testicle free in the first place, and afterwards cutting the cord?

But putting aside this objection of the possibility of a hernial sac being in the way, are there not other more cogent objections against this operation? For example, the thickening and disease of the tunica vaginalis, in hydrocele, may have deceived us, and we shall only discover this when we have in effect castrated the man. But is this not equally apt to happen when we dissect the testicle out in the first place? For unless, like Pott, we push a trocar into the substance of the testicle, as a first step of the operation, we shall be no better able to ascertain the disease when the scrotum is dissected off, than by feeling the testicle through the integuments.

In regard to the manner which I have recommended of tying the cord, it will be said, that the cord is apt to slip up into the belly. Mr. Benjamin Bell says, that he has seen this twice in his practice, and that the patients died of hæmorrhagy in consequence of it. It must have been a shameful business; and all that can be said is, that it is to be regretted there was no person present capable of giving a good advice. This retraction of the

cord is a consequence of letting the weight of the diseased testicle hang upon the cord, so as to pull it down before it is cut. When by cutting off the testicle, this weight is taken away, the cord retracts; we have to take care then (if the cord be then loose, and the testicle hanging,) to support the testicle, and allow the cord to retract as far as it will before it is cut. We shall not then see the cord jerk up into the belly on the incision being made.

If, however, we find the cord diseased in such a way that we should be tempted to cut it very near the ring, it is necessary to separate it into two fasciculi, and put the needle, with a double ligature, through betwixt them, before cutting the cord across, lest we should afterwards have difficulty from the retraction of cord within the ring. This ligature may draw down the cord, whilst we secure the mouths of the vessels; or not succeeding in that, we can tie this ligature so as to include the portions of the cord in two distinct knots.

But the manner I have described is still a better method by which the testicle itself is made to answer the purpose of this ligature; for instead of cutting the cord through at once, we leave one third of it; (not the body of the cord, or chief fasciculus,)—and having thus cut the main artery, the weight of the testicle keeps it drawn down until that artery or its branches are secured.

But if this should not be done, and the cord by any accident retract within the ring, death from hæmorrhagy is, I trust, still not inevitable. We

may follow the cord with all safety, even to the origin of that muscle, the cremaster, which pulls it up, if we know the course which the cord takes obliquely outward, along the grooves of the lower pillar of the ring.

It will be said that it is difficult to take up the artery separately. I have only to reply, that I have done it, and seen others do it who in other matters had little dexterity. It is with more truth said, that often it will happen that if you take up the individual artery, you will find that there are many mouths.

Sir Everard Home says, "I have known a surgeon take up the spermatic artery alone, then five or six vessels one by one; and after having kept the time necessary for this purpose, find himself obliged to include the whole cord in a strong ligature, so many other vessels continued to bleed." To me this only proves that in some cases the arteries are numerous, and that after dividing the cord, and seeing many vessels throw out their blood, we shall be obliged to include the whole cord, or to tie it into fasciculi. That we can thus do it, after having attempted a milder method, is an additional motive for attempting the ligature of the individual artery.

We wish to take every possible source of irritation from the extremity of the cord, yet having divided it, we tie a ligature either on the whole cord, or in two divisions. Observe the consequence: the cord is at this time enlarged and thickened, the part below the ligature does not slough off. The

ligature is apt only to diminish the mass of the cord and not to cut it through, the consequence of which is, that it hangs about the cord like a ring, whilst the extremity of the cord granulates and swells. The drawing of this ligature is attended with severe pain, of the most sickening and subduing nature.

But if we take up the arteries separately, we must still retain, till the second dressing, the large ligature for the cord, lying in the upper part of the wound, in case of the return of bleeding, and for the same reason that we keep the tourniquet on the stump.

Although I conceive the manner of operating, which I have already described, to be preferable in some respects ; that it gives less pain, and is more rapidly done ; yet I do not think it a matter of very essential importance, whether the cord be cut first, or after the dissection of the testicle. It is frequently done in the following manner.

We shall suppose that part of the integuments are diseased, or that a fungus has proceeded from the ulcer of the body of the testicle ; not such as I have already described as proceeding from the body of the testicle where there is no disposition to cancer, but that fungus which is characteristic of the open cancer.

The parts being shaved, and the patient seated, the surgeon grasps the testicle with the left hand, so as to make the skin tense on the fore-part of the scrotum. Then, well observing the extent of the diseased skin, he begins his incision A, over the cord, at that place where, by careful examination, he has found that it is sound. Drawing his knife down, so as to cut through the integuments, he carries it on the outside of the diseased attachment of the skin, as at B ; and having encircled the diseased portion of skin, the incision terminates in the bottom of the scrotum, C. Commencing his

second cut at E, where he first diverged from the right line, he makes it a counterpart to the last, E D C, so as to include within his incisions the ulcer, fungus, and diseased skin F G.

He now proceeds to dissect back the scrotum upon both sides, and to detach the testicle and its coats from the scrotum all around.

Having done this, and the testicle now hanging by the cord, he may take up such bleeding arteries in the scrotum as seem of sufficient importance to require this; and I have to add, that a little attention and deliberation in taking up these vessels, may save both patient and surgeon from much distress, especially if the integuments have been thick, and the tumour large and of long standing.

Lastly, having the cord betwixt his fingers, and with the before-mentioned precautions, he either ties and cuts the cord, or he cuts it and secures the arteries.

We bring the lips of the wound together, by adhesive straps. Putting over them a light compress of lint, then bringing out the bandage which has been previously around the loins, it is brought up betwixt the thighs and tied to the circular so as to sustain the whole.

OF ANEURISM.

It is not easy to embrace all the varieties of aneurism under a definition. Aneurism may arise from a wound of an artery, or in consequence of disease, and weakness of an artery. Aneurism may be attended with tumour, or the blood may be collected deep or internal. It may be attended with pulsation, or the pulsation may have ceased, or it may never have been a characteristic of the disease.

Aneurism is produced by the escape of arterial blood from the coats, which ought naturally to sustain it. As a tumour, it is sufficient distinction to say that it is a tumour formed by a dilated artery, or by blood escaped from a punctured or torn artery. The tumour from an aneurism is generally pulsating, colourless, and little painful. The terms *true* and *false* aneurisms were made at a time when the pathology of this subject was very imperfectly understood. If they are used in writing or in conversation, they mean by the first term, that tumour which arises in consequence of disease, and weakness of the coats of the artery; by the latter the consequence of the puncture of an artery. This is a difference of most essential importance, as touching the safety of the operation to be performed.

To enable me to explain the distinction of aneurism, which are meant to be made under the titles of *true*, *false*, *circumscribed* and *diffused*, or the French terms *aneurysme faux primitif*, or *faux consicutif circonscrit*. I must enter into a short de-

tail of the consequences which result from disease in the arterial coats.

When the coats of an artery become diseased and suffer permanent dilatation or enlargement under the force of the heart, without a breach or loss of continuity in any of the coats, it is an *aneurismal artery.* To the formation of what is called the *true aneurism*, it is necessary that the coats give way. My reader might conclude that this would be a rupture of the artery, undoubtedly this is often the case ; and if a rupture of the great artery occurs, the patient is suddenly taken off. But in the formation of the true aneurism the inner coats of the artery give way slowly, the strain on the outer coats and the surrounding cellular membrane produces an inflammatory reaction ; these coats are condensed and thickened by accession of coagulable lymph, so that while the gap of the inner coats is enlarging, the cellular membrane on the outside is acquiring strength. However nothing but the natural coats of the artery can sustain the impulse from the heart. This accession of condensed cellular membrane, though much thicker than the original coats of the arteries, yields to the blood's impulse, and forms a bag or aneurism. When this kind of aneurism is examined on the outside it is a continuous surface, and without hesitation, we would declare that it was entirely formed of the dilated arterial coats ; we are undeceived upon examining the inner surface of the bag, for then we either see the rupture of the coats of the artery through which the blood has escaped,

or that very little of the bag of the aneurism is formed of the arterial coats. Much has been said of the dilatation of the aneurismal sac. But in this case there is no dilatation, but on the contrary, the sac grows, and still as it is extended it is thicker and stronger.

My reader will now perceive, that the true aneurism is a consequence of the disease of the arterial coats (with the nature of which, it is presumed, he is already acquainted); the first stage is, the dilatation and consequent enlargement of the artery, without a breach of continuity in the coats. This is chiefly perceptible in the aorta near the heart. The second stage is marked by a more unequal enlargement, and the tumour forms to one side of the artery. In dissecting the aneurisms of the aorta, I find a very large proportion of the sac formed of the proper coats of the vessel; but, in dissecting the aneurisms of the lesser arteries, I have found very little of the tumour belonging to the original coats of the artery; but, on the contrary, I see the rupture of these coats distinct, and the termination of the hole in the artery abrupt and well marked. Some will have it that there is no aneurism without coagulum; that while the dilatation of the artery is uniform, the blood makes a free current through it, no coagulum forms, nor are there layers of lymph deposited.

When the tumour of an aneurism is first formed, the blood being fluid, it is compressible, and the pulsation is at the same time powerful. But as

the coagulum forms, and is impacted in layers, the tumour no longer vanishes on pressure. As the sac of the aneurism enlarges, the coagulum increases; and it is particularly worthy of observation in a practical light, that the enlargement of the tumour and the pressure of the coagulum do sometimes effect a spontaneous cure of this formidable disease. It probably happens in this manner: the tumour being at length nearly a solid mass of coagulum, and being entirely on the side of the vessel, it is at length resisted in its progress towards the surface; it therefore presses upon the artery, flattens it, and throws down the margin of the hole in the artery; so that it acts like a valve, and no blood is permitted to enter into the artery beyond the breach: or the interruption to the circulation may result from the encreasing tumour giving a new direction to the stream of blood; so that it is directed more into the bag of the aneurism, and less into the artery below the breach. However, the interruption to the blood through the aneurism is produced, the fact is certain, and it is of consequence that the surgeon should know the symptoms which announce this change.

Let us now turn our attention to the varieties in the false aneurism. To the formation of the false aneurism, it is not necessary that the coats of the artery be diseased. It is purely an accident,—the consequence of puncture or rupture of the artery. If an artery be cut in an open wound, it is not an aneurism, because there is no collection of the arterial blood. But if there occurs a wound of an

artery by a sharp instrument, which has penetrated in a slanting direction, then the wound is easily closed; but the artery continues bleeding into the tract of the wound, and into the cellular insterstices. It is a collection or tumour of arterial blood. It is an aneurism, but it is *diffused.*

If the wound of the artery be only a puncture; if the compress be put firmly down upon the wound; the condensed cellular membrane is accumulated around the puncture; the coats of the artery do not heal; the arterial blood escapes; but an imperfect sac is formed of the surrounding cellular membrane.—It is a false aneurism, but it is not a diffused aneurism.

Thus we see that the *true aneurism* is the more gradual formation of a tumour, either by the general yielding of the coats of the artery, or the rupture of the coats of the artery, while the blood is confined, and the coats of the tumour are built up of the sheath and condensed cellular membrane which surrounds the artery. The *false aneurism* we find to be the aneurism from rupture, by external violence or puncture of the artery. The *circumscribed aneurism* we observe to be a term, not distinguishing the real nature of the tumour, but depending solely on the power of the surrounding cellular membrane to resist the flow of the blood; it may resist it both in the false and true aneurism, so as with various degrees of density to build up a sac. In both the true and false aneurism, it may be unequal to contend with the force of the blood, so as to let it drive wide among the muscles and form a *diffused aneurism.*

OF THE WOUND OF THE ARTERY, IN BLEEDING IN THE ARM, AND OF THE OPERATION FOR ANEURISM THERE.

The blood flowing per saltum, has often made the face of the young surgeon pale with affright, but without reason; for the blood will sometimes flow from the vein in jets, owing to the general fulness of the arm, or the pulsation of the artery immediately under the vein.

The patient who applies to you with an aneurismal tumour, will, perhaps, say that he thought the lancet went very deep, and that the bleeding was unusually profuse, and difficult to be stopped. Soon after the operation, a small tumour forms on the part; at first soft, regular, and with an evident pulsation. In this first stage we may compress it, when the blood probably will return into the wounded vessel; or it may also pass into the deeper recesses, by the interstices of the muscles. At all events, this receding of the blood I have seen.

In a few weeks, or we had better say when the tumour is increased, the character of the disease is considerably changed. A tumour, not very prominent or regular, occupies the whole bend of the arm, having an obscure deep pulsation when we put the whole hand upon it. The arm is bent in consequence of the binding of the fascia, and the fingers are crooked. Now a firm coagulum is formed in the sac, and the fascia is stuffed and distended to the utmost; and we are no longer capable of compressing and emptying it by gentle

means. Bolder and more cruel attempts (and such I have seen made from ignorance and obstinacy, twin brothers), only diffuse the blood more widely, by bursting up the cellular membrane, and the deep connexions of the fascia.

In the end, by the continued pulsation of the artery, the blood poured out is so beaten together and impacted, that the pulsation of the tumour is scarcely perceptible.

The complaint which brings the patient to the surgeon, is not the tumour and pulsation; it is the lameness, the coldness, numbness, and diffused pain of the arm, proceeding from the compression of the artery, in consequence of the aneurismal tumour, and the distension of the fascia.

Though I have known no instance of it, there is a poissbility of a spontaneous cure. For when the tumour has distended to the last degree, if the accumulated coagulum should press so strongly on the artery as to interrupt the pulse which was free in the beginning of the disease; the collateral branches may become enlarged, and the current of blood may altogether leave the trunk of the artery. This is precisely the effect which is to be accomplished by the surgical operation. And immediately after the operation, I have felt the pulsation behind the elbow, and feebly in the wrist.

OPERATION.

The instruments necessary are only the common pocket case, scalpel, directory, probe-pointed bistory, a blunt hook, and aneurismal needle, and the tourniquet.

1. The tourniquet is applied by the assistant, who takes the management of it. The arm is held upon a pillow. You make the incision, beginning by the side of the biceps muscle, over the most prominent part of the tumour, longitudinally in respect to the arm, and so as to reach at both ends a full inch beyond the base of the tumour.

2. The integuments retracting, there rises into view a firm dark-blue tumour, formed of the impacted blood, covered by the shining fibres of the fascia.

The fascia, far from being stretched so as to lose its character, has become stronger, and more tendinous. This brings us to consider the anatomy of such a tumour. We have to recollect the difference betwixt the opening of a bloody tumour, and a deliberate and orderly dissection. The simple, though accurate ideas we have received in dissection, are apt to be confounded in operation. We think we are acquainted with the situation of the arteries, veins, and nerves; but we find nothing like to what we have ever seen before.

3. Puncturing the fascia, we slit it up in all the length of the tumour, either introducing the finger or the directory before the bistory.

We have here to recollect, however, that in some cases the artery has been entirely transfixed by an adventurous bleeder; and that, in consequence of this, the blood has been accumulated behind the artery, and the artery presented immediately under the fascia.

When the fascia is slit open, you can recognise

nothing with which you are previously acquainted. Instead of the artery and accompanying vein and nerve, there is an irregular dark-coloured cavity; and, from the bottom of this, on unscrewing the tourniquet, you see a jet of blood.

With the finger, warm water and sponge, the coagula are to be cleared away. We are now directed in general to turn the tourniquet, and allow the vessel to bleed; but much may be done previous to this. We put down the finger upon the spot where we see or conceive that the puncture of the artery has been made. And now the tourniquet being turned, we see that this is the point, by being enabled to command the bleeding, and by the jet which is thrown out when the point of the finger is lifted.

When the fascia is cut, the crooked arm will be allowed to fall flat on the cushion; but at this part of the operation we must bend it again a little, to allow us to separate easily the artery and the nerve. We must not dive with the needle above and below the bleeding orifice, else we shall include the radial nerve, as I have seen done. But we have to separate slightly the artery from its bed, not cutting it up extensively, lest we touch some enlarged collateral branch. Two ligatures are then to be laid under it; the one above, and the other below the orifice. Tying the upper one, we have the comfort of seeing the blood return from below, then we tie the lower ligature.

Bringing the integuments together, we dress the wound lightly, and keep the tourniquet loose upon the arm, as in amputation.

The arm is laid upon a pillow, a piece of flannel over it, and a bottle of warm water under the palm of the hand. The arm and hand are at first benumbed and cold, but soon regain their natural heat. From the sixth to the tenth day, the ligatures may be expected to come away : they ought neither to be tugged with violence nor cut short.*

POPLITEAL ANEURISM.

Of the arteries which take their course through the limbs, the artery which is behind the knee joint is the most exposed to disease ; or rather, we should say, to the most frequent consequence of the diseased state of the coats, aneurism. This is called the popliteal aneurism.

This is an example of the true aneurism. The artery sometimes gives way suddenly during exertion, and is attended with acute pain and lameness, or, I have seen it a consequence of a long walk. But though the proper coats have given way, the common coat, the cellular membrane, and the uniform compression of the surrounding parts, and the binding of the fascia, will often prevent any rapid increase of the aneurism. In the course of a very few days, there is total lameness, great swelling around the joint, and œdema of the leg and foot. In most cases the swelling is uniform, the proper aneurismal tumour little prominent ; the

* The operation as described in the Expose de la Practique de Desault, par X. Bichat, was very ill performed and ought not, as I conceive, to influence us in any way.

pulsation, however, is distinct, until the œdema spreads very much around the joint.

We do not operate in the place of the tumour, but in the fore part of the thigh, where the artery lies more superficial. The operation in the ham was given up, from the many bad consequences of deep incisions in order to get at the artery among parts already diseased, and the necessity of tying the artery both above and below the tumour; the consequences of which, were extensive sores and abscess by the side of the aneurismal tumour, extensive sloughing, ulceration of the artery, and repeated hæmorrhagy. In some cases, the triceps was cut across in pursuing the bleeding orifice of the artery.

For the advantages of the present method, we are indebted to Mr. Hunter. Mr. Home persevered in the views of Mr. Hunter, and established the operation. It is performed, with some variety in the manner of securing the artery.

Some will say as long as the tumour behind the joint is small, and the general swelling and tumefaction of the knee, leg, and foot, moderate, it may be proper to delay the operation: for during this delay, the collateral branches are enlarging. But on the other hand, let it be observed that when the tumour behind the joint is large and firm, the ham-strings distended, and the general swelling increasing, there is danger of suppuration in the ham after the operation.

OPERATION.

Instruments.—Scalpel, blunt-hook, directory, probe-pointed bistory, forceps, aneurismal needle or probe with a ligature of five threads, sponges, tenacula, adhesive strap and dressing.

Place of the incision.—It is wrong to conceal that there is some difficulty in placing the incision correctly in the right place, and it is of consequence that it should be right, as the errors I have seen committed are chiefly to be attributed to misapprehension on this head.

Let the surgeon observe the course of the sartorious muscle, for this purpose he may place the end of a cord on the superior spinous process of the os ilii, and lay it along the inside of the thigh, until it reaches the back part of the inner condyle of the thigh bone. Draw a line from the centre betwixt the spinous process of the os ilii, and the crest of the os pubis, directly down the fore part of the thigh until it touches the line of the sartorius.

1. Let the point where these lines touch be the centre of the incision, and the direction of it in the line of the artery. Let the length of the incision be from four or five inches, according to the depth of integuments.

2. When the integuments are cut, we may perceive a very thin aponeurosis covering the muscle, or perhaps the knife has touched it, and we are come to the surface of the muscle. We must observe the muscular fibres which now appear, for I have

witnessed very terrible blunders from mistake of the muscle; the cut ought to open the sartorius muscle, but if the cut should reach the surface of the triceps or the vastus internus muscles into what a labyrinth the operator would then be led. Let him therefore observe the course of the fibres of the muscle which he exposes, and that will inform him if it be the sartorious or not.

3. Having cut through the fat, and expose the fibres of the sartorious muscle, he turns aside the inner edge of this muscle, and now a strong fascia is observed under it. This fascia covers the artery.

4. A surgeon, who is no anatomist, will find himself a little difficulted in this stage of the operation. I have seen such a man cut, unscrew the tourniquet, cut again, unscrew the tourniquet, and look confused, stupid and irresolute. I have seen a very intelligent surgeon take the aponeurosis which covers the artery for the dilated artery itself. I have seen another look first on one side of the sartorius muscle, then on the other for the artery; enlarge his incision; cut the collateral arteries; and, as it were, contrive to perform in a bungling manner an operation which being performed in the natural state of the parts leaves no apology for mistakes.

5. Let the surgeon now dissect a little with the point of his knife not directly over the artery, but by the side of it, so as to open the fascia*; intro-

* The fascia must be known to the surgeon in dissection; it is that which spreads from the insertion of the *triceps*, and the origin of the *vastus internus*.

ducing his directory let him slit up the fascia for an inch and a half. The artery will be now exposed. He is next to take hold of the artery with the finger and thumb, and lift it from its bed of cellular membrane and separate it from the vein. The vein is under the artery, and the branch of the anterior crural nerve is some little way removed from the vessels.

6. In separating the artery from the vein he ought not to tear with any violence, but finding that the handle of the knife is not sufficient to pass through the cellular membrane which unites the vessels, still holding the artery, he touches the cellular connection of the vessels with the point of the knife, and then the handle of the scalpel, the probe, or the blunt point of the aneurismal needle completes the separation of the artery from the vein. I have seen the vein perforated with the point of the probe in consequence of attempting to force the instrument through without duly separating the two vessels.

7. If the artery is to be cut through, and this I recommend, we separate it somewhat more from its bed of cellular membrane; as much, perhaps, as will let the finger and thumb touch each other under the artery. Then pass under it the aneurismal needle with a double thread. The needle being cut off, two ligatures are formed. The one is to be tied as high as possible upon the artery, and the other as low. We then cut the artery through between the ligatures, by passing the probe bistory under it, and drawing the instrument towards us.

In Mr. Astley Cooper's observation, the ligature was thrown from the end of the artery, by the force of the arterial pulsation. Mr. Henry Cline, therefore, has proposed to put the needle and thread through the artery, after tying the ligature, and then to tie it a second time. This contrivance will prevent the ligature from slipping off the artery, but I do not think it gives any security against the ligature shifting below the hole made in the artery, by this mode of passing the needle.

A few hours after the operation, the patient's pulse rises. The lower part of the thigh and knee sometimes acquire an unusual degree of heat, while the leg and foot are cold and benumbed.

CONSEQUENCES OF THE OPERATION.—The most unfavourable circumstance during the operation, is to find the artery crisp and diseased: we have then to dread the ulceration of the artery, before it shall be closed above the ligature by the inflammation and coagulable lymph. This is the most common cause of failure after this operation. And the danger is not over till the ligature has come away. To guard against immediate death from this, the tourniquet must be kept on the limb.

Next to the hæmorrhagy, the danger of gangrene presents itself to the surgeon's mind. I do not think that the cause of it is generally understood; at least in the only two instances which I have seen, the cause was one which I do not recollect to have seen mentioned, viz. the inflammation and

distention consequent upon the suppuration of the tumour behind the knee. Where the tumour has been small, and the œdema slight, I have no fear for the re-establishment of the circulation of the limb. But when the circulation seems perfectly established a few days after the operation; and there comes great distention about the knee; and the tumour in the ham becomes large and firm; when the œdema in the leg and foot does not go down, and there is pricking pain shooting to the toes, with a dark colour of the skin; I conceive that there is danger of the vesications which precede gangrene, arising on the toes. This gangrene, I have seen proceed in its course uniformly for several days, and cease upon the bursting of the tumour, and the discharge of the blood of the aneurism, with a great quantity of offensive matter from behind the joint, and from under the bellies of the gastrocnemii. The tension, as I conceive, occasioned by the inflammation and swelling of the sac, had stifled and suppressed the free action of the collateral vessels and the return of the blood by the veins, so as to produce gangrene in the extreme parts. Should such a case present to me, I should have no hesitation in puncturing the tumour of the aneurism. To puncture it in this stage, after inflammation in the sac, I should imagine would be attended with no hæmorrhagy, but only with the evacuation of such grumous blood as flows with the matter when it bursts spontaneously. At all

events it should be so punctured that the opening might be closed again in such a way as to avoid accelerating the wide extending suppuration which sometimes follows the dissolution of the blood in the sac.

When gangrene has taken place, (from whatever cause, and here as in other examples) the system must be supported. The countenance and pulse will sufficiently indicate the necessity of this. The foot must be fomented. When this danger is warded off, the extensive suppuration, and the destruction of the bones, both from the matter and from their lying pressed to the bed by the weight of the limb, will endanger the patient's life. In this state we must still guard the general health, and wait for an opportunity of amputating.

But when the operation succeeds the tumour of the ham ceases to pulsate, and gradually diminishes, the numbness which was at first encreased diminishes insensibly, the stiffness from the disorder of the parts continues longer, but at last the use of the limb is entirely restored.

OF TYING THE EXTERNAL ILIAC ARTERY IN FEMORAL ANEURISM.

The true or spontaneous aneurism I have already observed takes place most commonly where the artery is passing a joint, because there, in the bending of the limb, the artery being also bent, it receives the full impulse of the blood in the angle, and the coats of the artery being already diseased

they are more liable to be further injured by the motions to which they are subjected.

In femoral aneurism a small pulsating tumour is perceived a little below the groin. By successive stages it bursts up the connexions of the fascia; for a time the perpendicular lamina of the fascia restraining the encrease of the tumour it is often divided into parts, in the last formed of which the pulsation is strongest, while from the coagulation of the blood in the other divisions there is less pulsation.

I have thought that tying the femoral artery below the tumour might divert the stream of blood from it, allow the blood to coagulate, and make a cure as in the natural process of obliteration of an aneurism. I find that this has been attempted in France, with very little success. There is no space betwixt the tumour and the ligament of the thigh; for indeed that ligament often circumscribes the tumour above, and consequently the crural artery cannot be tied there.

Mr. Abernethy has proposed, and has three times performed an operation for the cure of this aneurism. In the first instance the artery ulcerated on the fifth day after the operation, and small quantities of blood was occasionally discharged from it till the eighth, when the patient died. The case is related in the third part of his Surgical and Physiological Observations. The second in the first part of his Surgical Observations; and the third patient I have just seen, thirty hours after the operation. The tumour is lessened very much, the limb warm and perspiring. I re-

gret that I cannot give the result. There is a case pending in the Birmingham hospital also.

1. The operation is to be done thus: pressing the fascia of the external oblique muscle, the surgeon feels the beating artery; or if that is obscure, he ascertains the precise place of the artery by the relations of the superior and inferior spinous process of the ilium, and the crest of the os pubis, the artery lies exactly betwixt these two points.

2. He then makes an incision, about three inches in length, through the integuments of the abdomen, in the direction of the external iliac artery, beginning just above Poupart's ligament, and continued upwards.

3. His second incision goes through the aponeurosis of the external oblique muscle; he then insinuates his finger under the internal oblique and transversalis muscles, and betwixt them and the peritoneum; he divides them upwards to the extent of an inch and a half.

4. The knife is now laid aside, and the peritoneum is pushed up from the vessels of the thigh and psoas muscle.

5. The artery is next felt for, and now separated from the vein, on the inside, and the anterior crural nerve, which lies on the outside. He passes a double ligature under the artery, and he is particularly careful to have it of so great a thickness that it cannot cut the artery in drawing it very firmly. Cutting the needle from the ligature, the one portion of the ligature is pushed as high upon the artery as possible; the other is brought

low, and both ligatures are tied, and then the artery is cut in the middle, and the parts brought together. Mr. Abernethy is particularly anxious to avoid the vein, and not to include it in the ligature; as he rightly conceives, when the force of the arteries of the limb is so much diminished as it must be after the operation for aneurism, an obstruction to the return of the blood by the vein would probably produce gangrene.

What seems to have destroyed Mr. Abernethy's second patient, was the putrefaction of the blood in the aneurism, after the ligature had come away, and the circulation of the leg had been completely restored. If therefore he finds that in the present case the blood of the aneurism were to open a communication with the wound, certain that by this communication with the air, the blood would putrify, and become a source of mortal irritation to the system, he will then open the tumour, and wash the blood from it entirely.

I confess that my fears are still for the ulceration of the artery.

Since writing the former edition of this book, success has crowned Mr. Abernethy's labours, and this is now admitted among the number of the regular operations of surgery. There is much more to claim our praise here than he would deserve, who had merely ventured to tie the great arteries nearer the heart than had been done before. Circumstances occurred in the first unsuccessful operations, which would have deterred a man of common observation from proceeding

further: but Mr. Abernethy saw that the cause of failure did not touch the main question of the practicability of the operation, he persevered, and avoiding the former occasions of failure, perfectly succeeded.

OF ANEURISMAL VARIX.

This is a peculiar kind of aneurism, occurring most commonly as a consequence of pricking the humeral artery, while bleeding in the median-basilic vein. In that case it is a communication formed betwixt the humeral artery and the vein; in consequence of which, the blood escaping from the artery into the vein with unusual force, the veins are dilated and become varicose.

This communication is formed by the lancet, transfixing the vein and fascia, and puncturing the artery. As the blood in this case will be difficult to stem, the surgeon probably applies his compress very tight. This produces a firm adhesion of the fascia to the artery, and of the vein to the fascia, whilst the puncture made by the lancet remains open betwixt the artery and vein.

The symptoms and character of the aneurismal varix are these: there arises over the artery, a few weeks after the accident, a flat swelling of the vein, with the mark of the lancet in the middle of it. On placing the finger upon this tumour, a faint pulsation or vibratory motion is felt. There is a noise, or at least a peculiar feeling, which conveys that idea, 'between thrilling and whizzing.'

The tumour gradually extends from the median-basilic to the other veins; but the varicose enlargement is chiefly of the median-basilic, median-cephalic, basilic and cephalic veins. The tumour is, of course, greatest in the median-basilic vein; but both the distention and the thrilling sensation are, on applying the finger, felt some way up the arm.

The tumour is increased by hard labour and exercise. It is largest when the arm hangs; and both the enlargement of the veins and the thrilling sensation almost entirely subside upon holding the arm over the head. The veins do not subside upon putting a ligature on the arm below the communication. The motion of the blood is not only felt, but sometimes seen distinctly; and, if the ear be brought near the part, it is heard. It has been described as a hissing noise, or as if there was a blast of air sent through a small hole.

The humeral artery is enlarged, and its pulsation becomes unusually evident. The pulse at the wrist is weaker and smaller than in the other arm. Lastly, on pressing the median-basilic vein with the point of the finger, so as to stop the hole of communication with the artery, the median and cephalic veins become empty bags.

The most striking peculiarity in this kind of aneurism is, that the blood which escapes from the artery finds a ready passage into the circulation, a free vent; and, consequently, there is neither coagulum formed, nor does the tumour suffer a degree of distention equal to the common aneurism.

When the trunk of the artery is compressed, and the bag of the vein emptied, the veins become full again the instant the communication from the artery is left free. When the ligature is put tight about the arm, above and below the dilated veins, the blood can be pressed into the artery again, and the artery will be found distended; which great distention of the artery again subsides on the removal of the pressure from the tumour.

It was our great master Dr. William Hunter, who first explained the nature of this kind of aneurism.

In this kind of aneurism, no operation is required. It has been proposed to tie the communication betwixt the artery and vein; but that would certainly endanger the growth of a common aneurism; for the blood no longer having a free passage, might dilate the cellular communication. Compression is not likely to do good, unless done with much severity. Brambilla *(Act. Acad. Vindobon,)* has succeeded in curing it by compression, by using the graduated compress and bandage. There is much danger, however, that great wasting and stiffness of the arm will prove to be the consequence of that degree of continued pressure, which will either close the communication or obliterate the vein.

The operation by incision I think preferable to this of compression. The artery is not deep, there is no sac filled with coagulum. It would be easy to tie the artery above and below the communication. But I am far from recommending the tying the artery in the aneurismal varix, as long as the case

remains as it is described. Nor would the patient readily submit, as he suffers no inconvenience, and has the perfect use of his arm.

In some cases a slighter degree of bandaging may be necessary to support the parts, and to keep a check upon the motions of the arm.

I shall not lengthen this section by describing the operation for carotid aneurism, and I am not willing to consider the attempts at curing the axillary aneurism, as authorizing that operation. I am not willing that it should be admitted into the list of regular operations.

In conclusion, on the subject of desperate operations for aneurism, I must suggest to my reader that the question is not, whether we are to operate or to let the patient die. For I consider the method of Valsalva affords us at least an equal hope of relief. This method consists in reducing the patient to the extreme degree of debility, so as to promote the formation of coagulum in the sac of the aneurism, and thus to imitate the natural or spontaneous cure.

SECTION VII.

OPERATIONS UPON THE VEINS.

OF TYING THE VARICOSE VEINS OF THE LEG AND THIGH.

THE branches of the great saphena vein in the leg, and the vein in its whole course in the thigh, are sometimes greatly distended, and irregularly hard; the valves have lost their action, and no longer support the column of blood. This state of the veins greatly affects the force of the circulation, and often produces or is accompanied with ulcers of the leg.

When we consider the great frequency of ulcers in the lower extremity, the appearance of languid circulation which they present—the manner in which they are affected by the erect posture (becoming evidently darker)—and their frequent combination with dilated and varicose veins, we must perceive that they result from or are continued in consequence of a debility of the vascular system.

It also appears, that the distention of the veins greatly aggravates the debility of circulation; we

see it in the interrupted circulation of the smaller vessels in the leg and foot, and the tendency to ulceration which this produces on every trivial injury. We know in general, that the supporting of a part diseased, conduces to restore a healthy action. We conceive how a bandage by compressing, in a certain degree, the trunks and branches of the dilated veins, restores the agency of the valves, made useless by the dilatation of the veins. We can conceive how the lymphatic or serous effusion interrupts the activity of the smaller vessels; and therefore how the bandage and straps relieve by producing absorption of the extravasated fluids. It is by relieving this state of the circulation of the lower extremity that Mr. Baynton succeeds in his treatment of ulcers of the legs, by applying adhesive straps and bandage.

Not only the parts surrounding the ulcers are thickened, but when the veins are dilated, their coats and the surrounding cellular membrane become thick and firm, being stimulated by the pressure and weight of the blood. The straps or a bandage relieve this effect of distention, and by restoring the liveliness of the circulation, cure the ulcers. It is in this way we must explain the relief obtained by the use of the laced stocking in the case of ulcers and varicose enlargement of the veins of the leg.

Often I have seen patients come for relief on account of the mere painful distention of the veins in the leg and thigh; a disease more frequent in women. The saphena vein is distended in all its length—it has lost the guard of its valves—the

whole column of blood presses from the head and heart upon the veins of the leg! They become more and more distended, or rather permanently enlarged, varicose, tortuous, and irregularly hard in their coats; and when the patient stands long, there is an insufferable pain in the leg and ancle from their distention. It has happened that these veins have given way in some part, and the woman has almost instantly expired. Dreadful hæmorrhagy has taken place in many instances from the ulcers opening the distended veins.

To remedy or prevent these evils, an operation is performed on this principle; that if we altogether obstruct the return of the blood by the trunk of the cutaneous veins, the blood will find other channels, whose valves still possess their action. The blood returns by veins, which lying deep and not allowing of distention retain the play of their valves, the use of which no doubt is to relieve the limb from the weight of the column of blood.

OPERATION.

Instruments.—A scalpel, forceps, and blunt hook, a common needle, or an eyed probe.

The patient stands on a chair or table, so that the part of the saphena vein to be operated on be of a convenient height. The patient is made to stand, that the vein may be distended; I think it better, that the patient should sit upon a table resting the foot upon a chair. The assistant compresses the trunk of the vein, that the vein in the thigh may be

distended. The surgeon selects that part of the saphena vein, which is the trunk of the varicose knots; a little above the knee joint, is the best place. The surgeon makes an incision by the side of the vein through the skin. Then the assistant applies his thumb, so as to draw aside the skin, by which the incision of the integuments is brought directly over the vein. The incision is made in length, about two inches or an inch and a half according to the thickness of the fat. A ligature is passed under the vein, and tied.

The assistant now lets go the integuments which he had pressed aside with his thumb, and they cover the vein so that the ligature comes out obliquely from the wound. The wound is closed with an adhesive strap.

A soft compress is applied upon the vein a little above the ligature; and the leg and thigh are moderately bound by a general roller. The patient is enjoined to keep the horizontal posture.

The immediate effects of this operation are, that the swelling of the veins subsides; a slight pain is felt by the patient when we press in the course of the vein above the ligature; the distended veins of the legs and the varicose tumours, sometimes inflame a little; but, subsiding, they degenerate into hard knots and cords, and the blood forsakes them.

This operation should not be performed when the patient has a teasing cough. For after the operation, I have felt the impulse given to the column of blood in the cava by the action of the abdominal muscles and diaphragm strike strong

upon the ligature ; and every occasion of inflammation must here be carefully avoided. This impulse may tear up the new adhesions ; for the same reason, costiveness and violent straining of every kind ought to be avoided. To prevent the progress of inflammation along the vein, and to guard the ligature and inflamed part of the vein from distention, I advise the application of a compress above that part of the vein which has been operated upon.

It ought not to be concealed that patients have died after this operation, in consequence of inflammation of the vein, and irritative fever.

The operation is very often performed for ulcers of the leg. These ulcers depending on a varicose state of the veins, are generally low on the leg, on the ancle, or foot. They have hard elevated edges, and are of a dark or brownish red colour. A dark red extends over the skin around the ulcer, and varicose veins are around the ulcer. And upon the leg, the integuments in general, are often thickened. The operation is thus described by Mr. Home.

The patient stands upright, and the inside of the knee being turned to the light, a fold of the skin is pinched up transversely to the course of the vein. A cut being made across this fold when the skin is let go, a longitudinal incision is on the thigh, and the vein appears covered only with the apponeurosis. By making a little cut in the membrane on each side of the vein, (not dissecting further on its coats) the common silver-eyed probe, or a blunt silver aneurismal needle, may be

thrust under it*. The edges of the wound are brought together by sticking plaster. On the tenth or twelfth day, the ligature comes away. We are indebted to Sir Everard Home for this improvement in surgery, and he has the further merit of instituting the operation from a previous careful investigation of the pathological principle.

OF VARICOSE ENLARGEMENT OF THE VEINS OF THE SPERMATIC CORD.

The spermatic veins stand in nearly the same relation to the column of blood with the veins of the thigh and leg, and they are liable to the same distention. They become enlarged and varicose; they form a soft and irregular tumour of the cord, which is often attended with relaxation and diminution of the testicle, and a pain though not acute yet insufferable. This disease is more frequent in relaxed tall men; it is frequent in warm climates; it takes its origin, I believe, very often in consequence of slowness in the bowels, and the straining at stool.

The treatment of slighter affections of this nature is to suspend the testicle, to bathe with cold water, and to keep the bowels easy and regular. There is an aggravated state of this complaint, in which an operation may be safely recommended. When the varicose knots have been distinct, where they could be separated from the main course of the vessels of the cord, an opera-

* We are to recollect that the vein is sometimes double, and that in this case both are to be tied.

tion has been performed to include them in a ligature.

I have formerly assisted to perform the operation in this manner: the operator, feeling the cord and vessels, separates this knot of veins from the spermatic vessels, and gives the upper portion to the assistant, to be held very tightly, whilst he holds the lower part himself; he then makes a cut through the integuments, and exposes the varicose veins.

Having exposed the varicose vessels, they are to be separated as much as possible. Then where they are attached by vessels above and below, a needle and ligature is put round, and tied. The tumour being now included betwixt the two ligatures is to be dissected out.

The wound is to be brought together with adhesive straps, dressed with a little lint; and the whole suspended.

But I must remark here, that if the surgeon or assistant lose hold of that tissue of vessels which they have, in the turgid state of the vessels, ascertained to be those which form the tumour, they may find themselves at a loss in the middle of the operation to distinguish among the vessels of the cord, whether they have again got hold of the right knot.

How this operation restores the more vigorous circulation of the testicle, I am at a loss to comprehend; unless it be much assisted by the stimulus of the knife, as an old surgeon and friend of mine expresses himself: yet it certainly succeeds. I must, however, pointedly observe, that after an

operation of this kind, on examining the extirpated part, I have seen a full inch of the spermatic artery in the centre of it. Here, where I thought the testicle would waste in consequence, the patient did well, and expressed himself highly satisfied and relieved.

The operation I recommend is as effectual and more simple ; it is to lay open the skin over the enlarged coil of veins, to dissect round them, and to lay into the wound slips of lint so as to keep it open and cause suppuration. The patient in the mean time keeps his bed, so as to relieve the veins from their distention. By this operation the cellular membrane is condensed around the veins by which they are supported and prevented from enlarging.

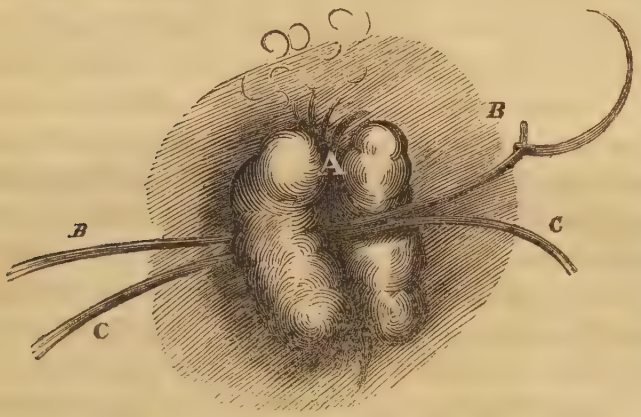
OF HÆMORRHOIDS AND TUMOURS OF THIS CLASS OCCURRING IN THE RECTUM.

HÆMORRHOIDS are venous tumours of the extremity of the rectum, which often pouring out blood have received this name : Hæmorrhoids are properly the bleeding piles, but all the tumours consisting originally of distended veins, which occur in this part are called hæmorrhoids. To consider the cause of these tumours is to explain the method of cure. Their cause is purely mechanical, in as much at least as regards their direct source. I shall not deny that disease of the liver, ascites, &c. may not be remotely connected with this complaint, nor am I prepared to assert that

hæmorrhage, occuring frequently from the rectum, may not depend upon some state of general derangement, or that the habitual loss of blood from this part does not establish a more extensive connection with the economy of circulation. Yet, I affirm the formation of the venous tumour in the extremity of the rectum to be from a local and mechanical cause. From irritation in the extremity of the gut, the lax inner coat swells, whilst the muscular fibres, contracting, push it down as they would matter within the gut. At the same time, the action of the muscular fibres constricts the hæmorrhoidal vein, and causes more effusion into the loose cellular coat. The sphincter relaxing as the upper portions of the fibres act, a considerable portion of the inner coats of the gut is sometimes pushed down and inverted. These tumours being several times produced, will at last become permanent. They produce great distress, tenesmus, difficult and painful evacuation of fæces, and frequent discharge of blood. They form very generally in two distinct clusters, on the sides of the anus. When there is a prominent and distinguishable point, or somewhat of a distinct tumour, hard, livid, and acutely painful, the ligature must not be used. It is the softer internal tumour which proceeds from the effusion into the cellular membrane, and consequent descent of the inner coat of the gut, that is to be treated by ligature; and I am equally certain that this is a state of disease which ought not to be operated upon with the knife.

OPERATION BY LIGATURE.

As preparatory to this operation, the patient should be put for some time over the steam of warm water, and made to strain, so as to produce the tumours in their full extent.



We shall then find that there come into view either one or two distinct smooth vascular tumours, which however partake of the softness of the inner coat of the intestine.

Supposing that we have to operate on the tumour A, we thrust the common crooked needle through the middle of the base; then cutting out the needle, we separate the two ends of the ligature, B C, and tying the ends C C, under the lowest portion, and B B also, close upon the anus, including the other portion, the tumour is com-

pletely strangulated, and drops off in a longer or shorter time, according to the thickness and firmness of its base.

After tying the inner coat of the rectum in this manner, we must not be surprised to find much pain and irritation in the neck of the bladder, and even such derangement of the action of the bladder as to occasion the necessity of using the catheter.

Tumours sometimes form so far within the gut, that it is only in very violent straining and evacuation that they are pushed down without the anus; and the surgeon has to operate on the base of a tumour situated some inches within the gut. Such tumours of this kind as I have met with, were nearly as soft and as easily bruised as a strawberry; but they are not always so soft.

Introducing the fore and middle finger of the left hand into the rectum, we grasp the root of the tumour, and betwixt the two fingers we direct the point of the needle used by Sharpe for the extirpation of the tonsils, or any similar instrument, and pierce the root of the tumour. We must now fix upon the point of the needle a bit of cork or wax. The next part of the operation is to put a ligature over the point of the needle, (by carrying the double of the ligature on the fore-finger of the right hand,) then making the surgeon's knot upon it, we draw it tight by means of Sharpe's ring, carried along one of the ligatures.

A, The needle, pushed through the root of the tumour. B, the ligature drawn round the neck of the tumour, by introducing the instrument C, along the ligature D, and by fixing the ligature (turning it over the fore-finger) and pushing the ring into the gut, drawing at the same time, on the other end of the ligature E, the knot is firmly tied, and the needle may be withdrawn.

PROLAPSUS ANI.

THERE is much in a name, the term prolapsus deceives us. This is not a falling down of the gut, but a protrusion of the intestine owing to a continued irritation and working of the gut within. It proceeds from the continual nisus to discharge something irritating the rectum, and the purest case is when ascarides, nestling in the lower part

of the intestine, occasion first a continued relaxation of the sphincter ani, then a swelling of the inner coat, and lastly, the inner coat being thus swollen is further squeezed and forced down by the muscular coat of the rectum. The further swelling of the protruded portion of the intestine is the immediate consequence of its descent, for it has escaped from the natural support, and besides the sphincter muscle, which ought to guard the protrusion, now girds the prolapsed part and produces a venous fulness.

The gut ought to be immediately reduced. If, however, it has been down for some considerable time, the coats become turgid and swollen, and it may require leeches to the verge of the anus, and fomentation, before the tumour can be reduced, nevertheless the attempt is to be made immemediately.

The patient is placed in an easy posture on his side in bed, so as to relax the belly. At first we press gently, endeavouring to reduce the size of the gut by grasping it and pressing it generally, then we attempt to put it up ; and when the tumour is diminished, and we are about to reduce it, we take a cone of paper, made moist and soft at the point, with this the whole is thrust up, and finally retained by compressing the nates together.

The after-treatment consists in relieving the irritation of the rectum, which had occasioned the prolapsus, (frequently in children the ascarides are the cause,) and endeavouring for the time, until

the parts have recovered their tone, by astringent washes and internal medicines, to prevent the gut from falling, or rather from being pushed down by the action in going to stool. The evacuations must be made in the erect posture, and with the hips pressed together.

An ointment suited to relieve the irritation of the verge of the anus, injections of lime water, or of astringent decoction, port wine, &c., are used to restore the relaxed parts. The belly must be kept relaxed, and no laxatives used that are likely to stimulate the rectum.

Sometimes a pessary of elastic gum may be used with advantage, or some ingenious substitute invented and applied.

But I have not yet spoken of the common complaint of piles or hæmorrhoids. These are distended veins, but soon lose their original character ; for as the veins swell under the forcible distention, the surrounding cellular membrane suffers extravasation, and the original tumour of veins is covered by the firmer fleshy substance, caused by the extravasation of lymph.

The first occasion of these venous tumours is a torpor of the intestine, and a want of the sheathing, lubricating secretion ; the exertion made to discharge the contents of the rectum forces the blood into the extremity of the veins. This forcible distention soon occasions the deposition of lymph

around the dilated vein ; the excitement continues ; the tumours enlarge ; and at length they become firm, and as it were, fleshy. While the attack continues, they are round, firm, painful, inflamed tumours ; when the inflammation subsides, they fall to loose folds of the skin. But the extremity of the vein is still contained within the pendulous tumour, and, with a return of the excitement, the blood is again obstructed in the veins, and the tumour inflames, until the vein bursting, the blood is discharged with more or less relief.

Such a tumour as I have described cannot be tied with a ligature ; the base is large, firm, and inflamed, the attempt would be attended with insufferable pain and irritation.

With piles there is often combined an inflammation, and tendency to suppuration, in the cellular membrane around the anus, while an accumulation of hardened fæces is formed in the great intestines. This distended and inflamed state of the parts must be allayed by local bleeding, laxatives, clysters, and low regimen, while anodyne fomentation and soft cataplasm are applied externally. Such a state of the parts requires care, as it often lays the foundation of fistula in ano.

When there is an attack of piles, attended with tenesmus, and the frequent contraction of the gut, a dose of a mild laxative should be given ; and upon it beginning to operate, a warm anodyne, or the injection of a thin starch clyster, with laudanum, to subdue the irritability of the gut. When the tumours will bear pressure, they should be im-

mediately reduced within the anus, and although not perfectly reduced, a compress wet with an astringent and anodyne solution, should be kept applied with the T bandage.

Some surgeons have been in the practice of cutting off the hæmorrhoidal tumours, when they have become permanent, with a pair of scissars, or at least the most prominent and painful of them, in consequence of which the others collapse.

This may be done in many instances with ease and success; the objection to the practice is, that there may follow hæmorrhagy, from opening the extremity of the vein.

When there have been irregularities or tumours within the rectum, I have removed them by recommending great attention to the state of the bowels, that is, to select such food as promotes the motion of the intestine, and such medicines as restore the natural secretions of the liver, and of the mucous membrane of the gut,—by the use of the rectum bougie, and frequent clysters of cold water.

SECTION VIII.

OF WOUNDS OF THE HEAD, AND OF TREPAN.

WHEN I recollect the fatal cases of injuries to the head which I have seen, and the appearances which have presented themselves to me on dissection, and when I try altogether to divest myself of the impressions received from books, the following short table of the causes of death from injuries of the head conveys my conception of the nature of the dangers to be apprehended. I state the cases in the order of their frequency.

1. The patient dies in consequence of the concussion of the brain, that is from the vibration of the blow passing through the substance of the brain; he does not recover from the universal debility thus produced.

2. The patient dies from the conjoined effect of concussion and extravasated blood. He revives a little from the debility of concussion, but presently sinks oppressed, and there is blood upon the membranes of the brain.

3. The death arises from injury of the bone, without fracture, followed by suppuration of the membranes of the brain, and of the brain itself.

4. From fracture and depression, produced by blows, where the substance of the brain in the neighbourhood of the depressed bone has been injured by the bone being driven in; the patient recovers from the effects of the concussion, but the brain has become deeply ulcerated, and he dies.

5. He dies from universal inflammation of the brain, in consequence of concussion.

6. He dies from ulcer of the brain and fungous tumour of the brain, sprouting through the openings of the skull, either occasioned by deficiency of the skull, the depressed portion being taken away, or the application of the trephine.

7. He dies from caries of the skull proceeding from an old injury, the bone at length produces ulceration of the dura mater, and the brain is ultimately affected.

This enumeration of the immediate causes of death from injuries of the head, brings us directly to the conclusion, I wish to urge with my reader, viz. that death is in all these cases from the affection of the brain, and that therefore to it must our attention be unremittingly directed. The injury to the bone is of itself nothing; but the blow being communicated to the brain through the bone, or the brain and its membranes, lying in contact with the injured bone, they partake of disease, and become the cause of death.—Therefore all the threatening symptoms are derived from the brain, and the constitution of the brain, as explaining these symptoms, must be the first study of the surgeon.

The good sense and discrimination of the surgeon is therefore to be exercised in ascertaining what are the symptoms of concussion; of compression; of the general state of inflammation of the brain; and of the partial inflammation of the brain, with ulcer.

Fissures, and slight depressions of the skull, are distinguished by no symptoms, unless in so far as the case resolves into some of the foregoing. For example, immediately after the accident they are attended with the symptoms of concussion, and afterwards, perhaps, with general or partial inflammation of the brain. But still these symptoms do not proceed from the fracture; they originate from the injury which the brain received, at the same time that the bone was hurt.

We have always to remember the remark of Mr. Hunter, that from a slight blow on the head, we find the membranes of the brain much oftener to suppurate than the tibia or fibula do from a similar blow on the shin. "These membranes of the brain appear to suppurate very readily, and with very little inflammation."

OF CONCUSSION OF THE BRAIN.

Concussion is that disorder of the brain which is more or less the immediate consequence of every injury of the head, from falls or blows. It is the effect of the vibration and percussion affecting the matter of the brain directly, and without the intermedium of the circulation.

In a slighter degree it is marked by giddiness, dimness of sight, weakness of the limbs, trembling and nausea; and this every one has experienced, who has struck his head against a door in the dark. There is in this state more of disorder of sensasion than of oblivion or dulness. There is less insensibility to pain than in oppression. When the brain suffers in a greater degree, the man becomes insensible; his face is pale, his skin cold, his limbs relaxed, his breathing low and weak, the pulse feeble, and the pupil fixed, and as it were little sensible. As the effects of violent concussion wear off, the sensibility gradually returns, the pupil contracts, the pulse rises, the skin gets warm: the patient can be roused from his lethargy as from sleep, or sensibility returns at intervals; he awakes, answers questions, and again relapses; reviving, there is confusion of intellect or delirium.

The explanation of these symptoms is, that with the function of the nervous system the powers of the circulating vessels also return; and now they correspond with the disturbance of the matter of the brain, and the vessels of the brain run into the extreme of over action.

If the patient having recovered in a degree, again falls low, with the symptoms of oppression from vascular action, the face is full, the features more in action, the pulse full, and risen to 120 or 140, and the breathing stertorous, this is not concussion. Or again, if, as the insensibility is removed, the high excitement of the brain succeeds; if the pulse becomes stronger, the eye more sensible to light, and the iris more moveable; if there

succeeds a contracted pupil, and intolerance of light, a flushing of the countenance, a wild look and incoherence, an impatience and restlessness, neither is this properly concussion. This is inflammation; and if to this high delirium succeeds, and this changes again into the low delirium of oppression, to insensibility and death, these symptoms do not belong to concussion, but are a very remote consequence of the injury to the brain. They proceed from the changes produced on the vascular system of the brain.

We now perceive, how the treatment must vary with the symptoms. I doubt if we possess any means of tranquillizing the first disturbance of the brain. But we see, that this primary injury to the matter of the brain is presently followed by a disturbance of the vascular system; and to that we can apply our remedies. When a man is thrown from his horse, and the pulse and breathing is scarcely perceptible, I can see no use in opening a vein, for as yet there is fear of death, from the immoderate effects of the injury; but when the eyes become vivid, and the cheek, from the paleness of the first effect, becomes flushed, we must then bleed largely and repeatedly, apply leeches to the temples, blister the head, purge, and afterwards keep the bowels open; and it were well if a nausea was kept up by small doses of tartarised antimony.

Often, however, the pulse does not rise to this violence of inflammatory action. An oppression, like to that described as the effect of pressure on the brain, immediately succeeds to the debility

produced in the first instance, with apoplectic character, stertorous breathing, insensibility to light, involuntary passing of the urine and fæces, and finally death. The explanation of these symptoms will be found to be, that extravasation of blood from ruptured vessels, has succeeded to the direct debility of the concussion. Here also bleeding will (if any thing can) prevent the increase of the coagulum.

I shall next suppose the pain, vertigo, confusion of sight, and nausea, which immediately followed the blow on the head, are removed, and that after some days, there is a return of complaints, with rigor, restlessness, and fever, it is a disease entirely different from the first nervous affection.—It has probably no direct relation to the concussion, but proceeds from some partial injury of the skull or brain. In the universal inflammation of the brain, which is occasioned by concussion, there is no such interval (as far as I have had experience) betwixt the first purely nervous effect and the rising of the inflammatory symptoms.

I dissected the brain of a man who had been imagined to lie ill of nervous fever, but who in reality had suffered an injury of the head, and in whom the inflammatory stage had followed the concussion, without the insensibility being much alleviated. The whole brain was inflamed, and very vascular, particularly one hemisphere; and on the surface there were large flakes of opaque coagulable lymph thrown out. There was fracture and depression of the temporal bone, which put the nature of the

injury out of doubt; but near that depression the surface of the brain was as natural as any part of the whole, while the greater degree of inflammation was removed from opposite the fracture, and was chiefly where the brain is in contact with the falx. There was little if any fluid extravasation, and there were exhibited the marks of the greatest degree of active inflammation which I have ever seen in the brain. Though the skull was fractured, yet as the inflammation was not great in the neigbourhood of the fractured bone, and as there was no adhesion, nor tendency to ulceration, in the brain or dura mater, near the injured bone, I conceived this to be a pure case of inflammation from concussion.

When a patient is recovering from the effects of concussion, the mind is for a long time very irregularly exerted; there is confusion of ideas, and partial loss of memory. Sometimes he remains long silly; or his speech is affected, or his limbs are feeble and almost paralytic.

OF INFLAMMATION OF THE BRAIN.

I CANNOT allow myself to make a distinction betwixt the inflammation of the brain and the pia mater. This membrane is not only the immediately investing membrane, but it passes down into the substance of the brain, and is the vehicle of the vessels. These vessels are the agents, and may be said to be the seat of the inflammation in all cases. But the symptoms of inflammation will be very

different, as they are the consequence of a general injury to the brain, or as they follow the progress of inflammation from the bone and dura mater to the surface of the brain.

If a man be lying stunned, and inflammation accedes before the return of sensibility, the pupils of the eyes become more contracted, the pulse harder and quick, the tongue dry; he withdraws his hand from the surgeon; his features have an unpleasant frown, and the cheek is fuller and red.

If we now wait for the return of the senses, before we use evacuants, we may be greatly deceived by the powers of the system rapidly failing under the pressure of this additional injury to the brain.

If the senses be awake, and the inflammation then accedes, it will be marked by the fever, and intense pain of the head; by a flushed countenance, inflamed eye, intolerance of light, tinnitus aurium, and watchfulness. Then when the paroxysm still rises, there is fierceness of the countenance, delirium, and violent struggles.

There must be here a vigorous plan of treatment pursued, or the texture of the brain may suffer irrecoverably, or the patient sink into the oppression from over action and effusion. We must bleed largely and repeatedly, and apply cold to the head; brisk purges must be given, and repeated with antimonials; and when the stroke of the pulsation of the carotid and temporal arteries are somewhat subdued, there may be blisters largely applied to the head and neck.

Every medical student can enumerate the symp-

toms, and every body can recognize the features of inflamed brain. But I have to put my reader on his guard, so that he may know a different class of symptoms the moment they appear. I speak now of that inflammation, different no doubt, and more partial in its operation, which ushers in abscess and ulceration of the brain.

How often may we see a creature, the neglected inmate of an hospital in this condition; his features sunk, the complexion earthy, the eye turbid; as he moves around the bed, his limbs tremble under him; he is found wandering in the ward by night; and being questioned, returns to bed: there succeeds to this an obliquity in the eyes; slight convulsive twitches in the muscles of the face; he becomes more and more lethargic; but for a time he can be roused to return incoherent answers; he falls altogether oppressed and insensible, and dies. This also is inflammation, for there is ulcer or abscess of the brain; and surely that is a process of inflammation.

OF COMPRESSION OF THE BRAIN.

I SPEAK now of compression of the brain; because I wish to remove the confusion which results from the complication of symptoms, of compression, concussion, and inflammation.

It seems very likely that many of our best surgical writers of the last age formed their opinions respecting the cause of symptoms, only from what they saw during operation, and not from investigation by dissection. They could not else have con-

founded the effect of matter and serum lodging on the brain, with that of depression of the bone, or effusion of blood. From what I have seen in dissection, I am convinced that they have attributed to the matter lying on the surface of the dura mater, that which ought to be assigned to the effect of deep ulcer and suppuration of the substance of the brain.

As to the question, whether the symptoms of oppression can proceed merely from the degree of compression caused by a little purulent matter? I can only say, that I have seen a much greater degree of encroachment upon the area of the cranium, occasioned by a depressed bone, or a coagulum of blood, without producing the same effect. This leads me to conclude that the comatose symptoms, where matter is upon the surface of the brain, are the consequence of the inflammatory action which accompanies this state of disease, and that it is not the pus which causes the oppression.

Wherever the function of the brain, and its due influence on the other functions of the body, are morbidly diminished, Oppression is the term made use of. With the failure of the sensibility there is a torpor and want of activity, which creeps over every faculty of mind and body. And of this state, the term Oppression is descriptive.

Compression of the brain is that encroachment upon the area of the cranium by depressed bone, blood or serous effusion, which causes a diminution of the apparent bulk of the brain. The symptoms are:

1st. Pain of the head, giddiness, and dimness of sight, dilated pupils, nausea and sickness, a slow labouring pulse, lowness, and increasing insensibility. 2d stage, Stupefaction, or partial paralysis; loss of voluntary motion; apoplectic stertor in the breathing; involuntary evacuations.

In apoplexy we cannot say that the symptoms proceed from compression, occasioned by the coagulum, when we find that similar symptoms will prevail where there is no coagulum, nor, in the case of depression of the bone, can we say that the insensibility proceeds from the compression purely, because there is at the same time concussion or injury of the brain; nor in the case of coagulum betwixt the dura mater and bone, can we say, that the symptoms are altogether from the extravasated blood, because this also has been the consequence of a shock which must have affected the functions of the brain, since it has been so severe as to rupture the larger vessels, or separate the dura mater from the bone.

PATHOLOGICAL PRINCIPLE, EXPLAINING THE SYMPTOMS OF COMPRESSION.

Pure compression, as from effused blood, does not act on the matter of the brain, which is incompressible, but on the blood circulating within the cranium. It acts by diminishing the capacity of the vessels of the brain, and consequently by diminishing in a greater or less degree the supply of blood to the brain. Following a diminution of blood, there must be a diminution

of sensibility; for the function of the brain, and all depending on its influence, exists only by the continued influence of the blood. Then, with the torpor of the intellectual powers, comes insensibility of the body, and a diminution or total extinction of power in the voluntary muscles.

If the bone be depressed, it will be apt to act more partially; and if pushed deep upon the brain, it will act as a sharp irritating body, and show the effect of partial compression by a paralytic affection, whilst the general consequence of diminution of the capacity of the cranium accompanies this paralysis. But it requires a much greater degree of depression of the skull than is generally imagined, to produce the more universal compression of the vessels of the brain, to diminish the capacity of the vessels so generally, and to that degree, as to impede the influence of the circulation on the brain, and to oppress its functions.

However produced, the symptoms of compression are not sudden as those of concussion. There is, as it were, a gradual extinction of the powers of the brain. There is an oppression of the senses, from which for a time the patient can be roused; an insensibility steals upon the body; the heart is loaded with blood, for it also has a degree of insensibility to its stimulus, in consequence of the injury to the brain, which produces a state the very reverse of inflammation. It is languid and slow in its action; and as it operates on a full ventricle, the pulse is full, but soft; there is no quickness or jar in the stroke. The respiration has always

a consent with the state of the circulation; it is deep and labouring. Partaking of the loss of action in the voluntary muscles, those of the larynx, pharynx, and velum are relaxed; they hang loose, on the inhaled air, and produce the stertorous breathing.

INJURIES OF THE SCALP, BONE, AND DURA MATER.

This is not the place for explaining the connections of the integuments, pericranium, bone, and dura mater. We have now only to observe the effects of their relation in injury and disease.

A contusion of the scalp, has a ring of inflammation, with a soft centre, and may be mistaken for a depression of the skull. In these and similar tumours of the scalp where there is much blood extravasated; we bleed and keep a cloth wet with spirits on the head.

If a man has his scalp cut from the skull, but still with a broad adhesion to the rest of the integuments, and if it be alive and bleeding, it is to be replaced, and preserved in its place by adhesive straps, and by a soft compress and roller.

Stitches are unnecessary, when the parts can be laid down upon the bone*. They are here worse than unnecessary. What has a surgeon to

* There is undoubtedly some peculiarity in the scalp, which makes the injuries of it troublesome or dangerous, more than what is derived from the direct communication of disease to the brain. I attribute this to the sensibility of the hairy scalp; to its being spread over the bone, and being more liable to be bruised than any other part; and to the numerous connection of its nerves with those which go down to the viscera. Indeed, with every important nerve has the lesser sympathetic, or portia dura,

say for himself in excuse, when he has sewed the integuments of the head with a needle ligature, and tetanus attacks his patient?

A cut or puncture of the scalp, if it be simple, that is, if the bone be not injured, requires only that the lips of the wound be kept in contact, and it heals in thirty-six hours.

The *temporal artery* or *occipital artery* may have been opened when the scalp was cut or punctured; but still we avoid the use of the needle on the scalp. It is better to draw out the extremity of the artery and tie it: better to cut the scalp with the knife and expose the artery that it may be tied, than push the needle through the scalp. I have lately seen the whole corps of surgeons of an hospital talk loudly of "our manner of using the needle:" which was to transfix the scalp twice, so as to include the artery in the ligature which they tied on the outside of the integuments; this is not to be imitated. When the compress is used it ought to be made to press on the outside of the integuments, not placed in the wound.

If the integuments of the head are torn and bruised, and the dirt be kneaded into them, as by the passing of a cart wheel upon the side of the head—then, as the parts must suppurate before they unite with the bone, a large poultice should be applied, and suppuration assisted. When the parts are clean and granulating, lay them down as recent parts.

and the branches of the fifth nerve connection. Besides, though we cannot in the same manner trace the connection by nerves, there is an intimate sympathy existing betwixt the brain and scalp.

But this advice is by no means absolute. If the dirt can be washed away, and the skin be not much bruised, the parts may be made to adhere, at least partially, so as to diminish the extent of the wound. But what I particularly wish to guard my reader against, is suppuration lying concealed under the scalp; for when the integuments are injured, as I have described, there is danger of their adhering only at the edges, while matter may be lodged under the loose scalp. At all times when the scalp is laid down for adhesion, the surgeon must continually watch its progress, and be careful to ascertain by the touch, and the degree of tenderness, by the quaggy soft feel, and the blush of inflammation among the hair, whether suppuration be not taking place instead of adhesion.

If the matter be allowed to form, it may fall down with rapid progress by the side of the ear. The integuments must now be punctured at a depending part, and the state of the bone ascertained by the probe. If the bone be not bare and rough, the matter must be squeezed out, and compresses brought gradually to encroach upon the margin of the abscess, so as to procure adhesion. But if the surface of the bone has been injured, and is now exfoliating, the scalp must be freely cut up.

But something more remains to be said on injury of the scalp, particularly on the contusion. To the eye the scalp may appear cut simply when it is severely bruised. Where the blow with an obtuse body has been oblique, the scalp will be

cut, as with a sharp instrument, but nevertheless the parts are much bruised. Violence done by an obtuse or flat body may cut the scalp, but then the force must have been great.

If the outer table be cut off from the skull, and be adhering to the scalp, I think it should be cut away, and the flap laid down on the diploe.

INJURIES OF THE BONE.

The injuries to the bone may be considered under these heads :

1. *Contusion*, viz. where the bone is struck and injured in its life though not fractured.

2. *Injured as by a punctured wound :* for example, when the skull is struck with the point of a pike or sword, or the sharp end of a hammer.

3. *Fissure* of the bone.

4. *Fracture.*

5. *Fracture with depression.*

Before entering on the consideration of the subject under these heads, we ought to recollect that the great leading fact, which is to guide us, is the degree of injury done to the brain. We ought to put to ourselves these questions,—is the brain injured ? Is the brain liable to suffer in consequence of this injury to the bone ? If the brain be in danger of inflammation, how is it to be guarded against ? By operations on the part, or on the system at large ? And if the case be full of danger it behoves us to make careful note of the symptoms which are to usher in the stage of danger,

and to be aware of the secret insidious manner of its approach.

When the corner of a stone has struck the head and bruised or cut the integuments, and bruised the bone, it is a very bad wound; one in which the danger is to be dreaded, whilst yet we cannot act decidedly to prevent it.

The bone may be deadened by the blow, and become a source of irritation to the membranes beneath. The bone may be deprived both of pericranium and dura mater, by the blow and percussion, so that losing its vessels it dies. The consequence of this is suppuration under it, and an abscess may be thus formed in the substance of the brain. It is fear of this which makes the shivering and sickness so formidable symptoms, when consequent on a wound of this nature.

There is an injury of the skull which produces the PUFFY TUMOUR OF THE SCALP, and which is the most frequent occurrence of any. It is pregnant with the most imminent danger. It occurs when the scalp has suffered by the blow, and yet there is no cut. Some days after a scuffle, the patient begins to feel pain in the part where he supposed that he had received a very trifling injury. The part is acutely pained on pressure, and there is a soreness over the whole head. Upon the place where the bone was injured, there is a puffy diffused swelling. By and by the patient becomes languid, and inattentive to questions; rigors succeed; his strength fails, and the pulse becomes

quick; the sleep disturbed. Or, after lying insensible for some time after the injury, he recovers and remains for a day or two quite sensible; but there is a sickness and indescribable languor: then follow frequent fits of shivering succeeded by heat, and great restlessness, confusion of the mind, and head-ach; his countenance is bad, the skin is pale, and the limbs weak and trembling.

When the bone is laid bare by incisions, the pericranium is found to be separated from the bone. The bone dries quickly on exposure; for the surface is dead. Probably both tables of the bone have suffered; in which case the dura mater will have separated from the inside of the bone.

If the bone is dead in an open wound, the integuments are pale, gleety and loose, and the edges are observed to separate from the cranium.

Both the physician and surgeon should be aware of the slow progress and gradual effect of the caries of the skull after contusion. When the bone has been injured, but not deadened, it falls slowly into disease; it becomes carious and spongy, and admits the oozing out of matter. The dura mater does not separate from the bone, as in the more common case of death of the bone from injury; but being the internal periosteum of the bone, it partakes of its disease, and grows into its carious cells. This is a disease of the skull, like to the common disease of bones, where the external and internal periosteum, and substance of the bone, is diseased with decay of internal parts, and the formation of exostosis.

But here the brain is still the source of apprehension and danger: and if the disease be neglected, sooner or later the surface of the brain will become diseased, and abscess form in its substance. When the disease is in an early stage, the exfoliation of the bone, or the cutting of it out by operation may save the patient; but should the granulations of the dura mater have sprouted into the interstices of the bone, our endeavour to extract the diseased portion will endanger the tearing up of the dura mater, and by violence we produce a fatal accession of inflammation.

When we apprehend that the bone has suffered injury, we should bleed largely and repeatedly; but when the disease of the bone has commenced —or rather, we should say, when the bone is dead —what can we expect from purging and bleeding? A large trephine is then to be put on, and the diseased portion taken entirely away. This frees the matter on the dura mater from confinement, takes away the source of irritation, and allows of granulation.

But I again repeat, that so great is the tendency of the brain to suppurate, that if the dura mater is much diseased, we may suspect, nay be almost certain, that the pia mater has adhered to it, and that the surface of the brain has suppurated. What should be done in this case? The general opinion is, that the dura mater should be punctured. The case is full of danger, but nevertheless, I recommend that a small oblique puncture be made in the dura mater.

I must refer the reader to what I have delivered on the subject of contusion by a musket ball.

OF EXFOLIATION OF THE CRANIUM.

The last observation which I conceive it necessary to make on the injury of the bone, relates to exfoliation. This process is very frequently the consequence of contusion of the integuments, or abrasion of the pericranium. The outer table is dead, and deprived of vascularity; it becomes a source of irritation to the meditullium and inner table, which still preserve their vitality. This is the commencement of the change. The inner table inflames; and by the absorption of the earth of bone within the influence of its vessels, granulations shoot into the space left by the absorbed bone, and seem to push off the scale of exfoliation. But in fact the granulations, by growing into the irregular surface of the exfoliating table, often retain it for some time.

In young people, this process is more easily and quickly performed than in old. I have seen from the skull of a young infant exfoliations of the size and thickness of wafers, proceeding as I conceived, from injury by the forceps. In old people, this change is very slowly produced; and very often the firmness and density of the earthy part of the bone keeps the exfoliating portion long attached, and a source of irritation to the bone beneath, until the dura mater ulcerates. Of this I have seen many examples, when a little more

absorption would have safely separated the surface of the bone, and have saved the person's life. In other instances, I have found that when there has been an effort of the lower part of the bone to detach itself from the dead surface, (and the formation of a shallow furrow has been the mark of beginning exfoliation,) the whole bone has yielded to the ineffectual effort, and become dead; then the dura mater having separated from the bone, and matter having been formed on the surface of the dura mater, an ulcer in the brain has cut the person off.

It becomes thus a question of some importance to determine whether interference may assist this process. We ought, I conceive, to keep the vascular action low; for exfoliation is naturally a slow process, and the danger is, that the irritation of the dead portion of bone may be too much for the part beneath. But when the bone is loose, and yields to pressure, we must take care how we apply instruments which may bruise and irritate the soft parts beneath.

In perusing authors on this subject, let my reader understand the distinction of what they term insensible exfoliation. It is in truth absorption, it is that roughness which is left upon a bone which has granulated. Thus in looking to the many specimens of this in my Collection, the student may perceive that the exfoliating portion of bone is smooth. That is, it is dead, and there is no action going on within it; but often, to a very considerable extent around, there is evident marks

of absorption, which on reference to the state of the wound, when the patient lived, we find to have been that part of the surface of the bone which was covered with granulations.

Dry lint may kill the surface of the bone but cannot quicken exfoliation. Tincture of myrrh, or of aloes, or strong spirits, can only act on the dead bone by producing cold, and if they act at all they will retard exfoliation.

Tenon proved by experiments, that exfoliation took place more rapidly when mild emolient dressings were applied, than when stimulating applications were used: the error arises here from his supposing spirituous applications to be stimulants.

Billoste thought by perforating the bone to save it from exfoliation, but he found the process accelerated! To be sure he must, for this was an injury to the living bone beneath, which roused it to more activity.

OF EXTRAVASATION OF BLOOD BETWIXT THE BONE AND DURA MATER.

There is certainly something obscure and difficult to understand in the phenomenon of blood being found lying betwixt the bone and dura mater.

I find a man who has fallen from a great height lying comatose, with a very feeble pulse. He is trepaned, and a coagulum of blood is found under the skull, an inch in depth. The coagulum is cleaned away; the man considerably revives; but there is no further flow of blood. Surely it could not be that an artery had been torn, and that this

artery had bled with such impetuosity that it tore up the adhesions of the dura mater to the bone? Would not an artery that had force to tear up the dura mater bleed still when the coagulum was taken away by operation?

The truth is, that by the shock the dura mater is shaken from the bone, and that in consequence of this the blood is poured out by innumerable small vessels, which soon cease to bleed, and not from large vessels, which, were we even to allow that they throw out this coagulum, are not able to tear up the adhesions; which indeed I with difficulty sometimes can do with my hands. This explanation is the suggestion of my brother, arising first in his mind, if I recollect, from the circumstances, of a case in which I was operating. I put this idea to the test of experiment. I let the head of the subject fall upon the floor of the dissecting room; I found the dura mater shaken from the skull. I took another occasion of repeating this; I then injected the carotids with size, and found the *coagulum* under the bone where the violence had been done.

The shock which is the cause of the extravasation, will also occasion the symptoms to be complicated with the effect of concussion, or a shock to the brain. I have never seen compression purely characterized, when it proceeded from mere external injury. But I have seen cases where there was reason to suppose that the breathing was more sonorous, and performed with greater difficulty and heaving, and a more languid pulsa-

tion of the artery, in consequence of this oppression from extravasation, being combined with the effect of concussion.

The trepan is employed for the evacuation of the coagulum. If the bones be at the same time broken, and the coagulum exposed, we should endeavour to take the blood entirely away, to allow the dura mater to rise, and to this end also we may have occasion to use the trephine.

When (say authors) we do not find blood under the bone, but see the dura mater elevated, tense, and of the colour of lead, and fluctuation under it, we may open it with the lancet. Then, indeed, they may add the patient is in extreme danger.

This is one of the advices which stands as it were on a level with the most evidently correct and acknowledged rules of practice, and the young surgeon proceeds to open the dura mater as a matter of course. If the blood has been extravasated in that quantity to occasion the oppression of the functions, it will have extended round the base of the brain, and the opening of the dura mater will expose it to the air without evacuating it. If a small quantity be extravasated, may we not trust to absorption?

OF THE OPERATION OF TREPAN.

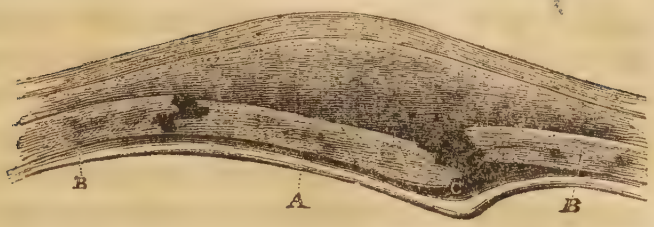
The trephine is applied, 1. To prevent the depressed and irregular bone from becoming a source of irritation to the membranes, and consequently to the brain itself; the effect of which we have already explained. 2. To remove the dead portions of the bone, when the dura mater has separated from it, and matter lies upon that mem-

brane. 3. To evacuate blood effused betwixt the bone and dura mater. 4. To enable us to raise great depressions of the skull, which are oppressing the brain.

Let us never forget that cutting down the integuments, perforating the skull, and laying bare the dura mater, forms a very serious and dangerous wound, which is not to be risked, unless when a more pressing danger is to be removed. Evident as this injunction may appear, it seems to be very necessary.

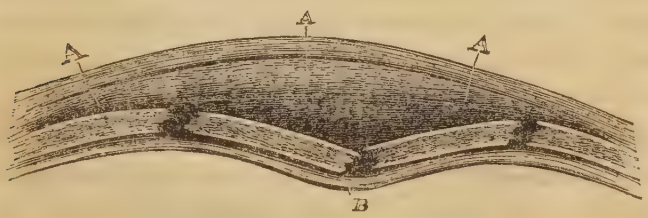
When there is fracture and depression, without any urgent symptoms, the general rule is to trust to a natural process for relief. I must say, however, that by the concurring opinion of several eminent men, this rule may be carried too far, and I am of this opinion, although I look upon the operation of trepan as a very serious injury.

If it be said that the danger of oppressing the brain should not induce the surgeon to operate, and that to perform trepan, in order to raise the bone which seems to threaten, or to cause oppression, is to act from a needless alarm—I should answer, that it is not upon the footing of this danger that I rest my opinion. I know that it takes a very deep depression to oppress the brain. But what I rely upon is this, that when I feel a rough edge of the fractured skull, from which the corresponding part has been depressed, I must conclude that the edge which presses on the dura mater is from the brittleness of the inner table, rougher, and armed with more sharp spiculæ than that which I feel with my finger.



This sketch demonstrates the state of the part. A, the depressed bone. B B, the circle of the skull in its natural position. I affirm that there is great danger of the dura mater being irritated to suppuration or ulceration, from that point of bone at C; and I always endeavour to judge of the sharpness of the depressed edge, before I advise the use of the trephine.

In a fracture of the kind, which is here represented, I conceive that *cæteris paribus*, there is much less chance of its irritating the membranes.



A A A, the natural circle of the cranium. B, the angle of depression, which, with a greater degree of depression than the last, does not present so sharp an edge to the dura mater, and consequently is not so dangerous.

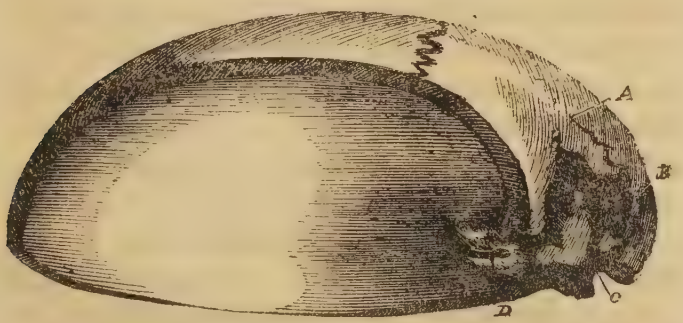
And here I am naturally led to remark on the subject of bleeding in cases of trepan, that as in inflammations of the lungs, our safety is in bleed-

ing, so is it in this case. Bleeding acts in two ways; by subduing the inflammatory action of the circulating vessels; and at the same time, by subtracting a quantity of blood, giving a calmer motion to the blood in the brain, and subduing the impulse of the brain against the depressed bone, or the edges of the trepanned hole. So it is in inflammation of the lungs: by bleeding the inflammatory action is diminished, while the lessened velocity of the circulation and quantity of blood in the system, diminishes the call for respiration, and gives a quieter and more equable motion of the lungs. In all cases in which there is an irregular surface presented to the brain, I dread a strong hard pulse, as necessarily perpetuating the injury of the membrane of the brain, by pulsation against the bone. In every case, therefore, except in that state which immediately follows concussion of the brain, the circulation must be kept very low, and all tendency to over-action of the vessels of the head is to be counteracted.

The different kinds of injury of the bone require no further definition than the names themselves imply. 1. Contusion. 2. Capillary fissure. 3. Fissure. 4. Fracture. 5. Fracture with depression. I may only add, that fissure being the rent of the bone, without the gaping of it, is more generally produced by falls, when the head hits broad upon the ground; and that fracture with great depression is more frequently the effect of sharp blows.

For a very evident reason when we have to fol-

low a fissure, we cut upon that extremity which runs towards the temple. If there is a fissure in the temple, with bleeding from the ears, we may suspect that the rent has gone down into the base of the skull. If the fracture is on the lower part of the frontal bone, the orbitary plate of the frontal bone may be beat up; and I have known two instances where this had happened and been neglected. This marginal plate, taken from one of my preparations, will explain my meaning. A, the frontal bone. B, the frontal sinus. C, the outer table, forming part of the sinus, beat in. In consequence of this, the orbital plate has been beat upon the anterior lobe of the brain.



When a fracture passes the margin of the orbit, but especially if the margin is shattered, we should lay down the eye-brow, and feel the socket with the finger.

Although we do not operate on account of a fissure, yet it is very often necessary to ascertain the existence of a capillary fissure. A fissure may, we

are told, be confounded with a suture, or the mark of an artery on the surface of a bone. But in either of these cases, though there may be some inequality of surface, there is not the peculiar gritty roughness which the point of the instrument conveys to the feel, when it is drawn along a rent or fissure. Further, when the pericranium is taken off, and the surface of the bone rasped over the suture, these natural irregularities disappear; but when there is a fracture or fissure, it becomes more distinct and defined, when the bone is a little cut down.

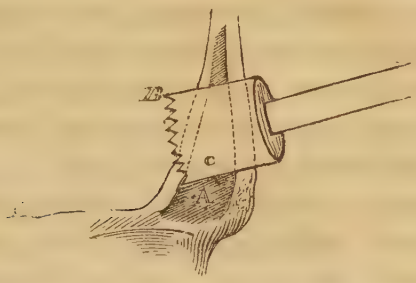
The blood sinks into a fissure, making a dark line; but it does not sink into the suture.

Without incision of the integuments, it is impossible to discover the place of fissures, for the swelling of the integuments over the injured bone is very deceiving.

There is no part of the cranium exposed to injury from without, on which we may not apply the trephine, with such precautions as the knowledge of anatomy suggests.

Parts which I should wish to avoid are, 1. The centre of the forehead; for the ridge or internal spine of the frontal bone sometimes runs high, and if the crown of the trephine is set on here, we may pierce one half of the circle before the other, so as to injure the dura mater; and to avoid this, it requires the breaking up of the spine with considerable violence. 2. Over the frontal sinuses also, is an awkward place on which to perform trepan; for if we continue the perforation on the same level that we first apply the trepan, we shall cer-

tainly cut the inner table, (which forms the back part of the sinus,) entirely through on one side, before it is touched on the other.



A, being the frontal sinus ; B, will penetrate into the brain before C has touched the back part of the sinus.

I would advise, that in operating upon the sinuses, we should apply, first a large trephine, to perforate and break up the outer table, then a smaller one, which might be placed within this larger circle, perpendicularly upon the inner table.

In operating behind the ear, or on the occipital bone, we must also have recourse to anatomy, and recollect the inequalities of the bone on the inside.

In operating on the temporal process of the parietal bone, we must expect to hit upon the groove containing the great artery of the dura mater. We should avoid it, therefore, if another place of the bone be found convenient for the elevation of the depression. We need have no dread of operating above the longitudinal sinus.

The INSTRUMENTS necessary are these—The

common pocket case; a scalpel and probes; tenaculum; a quill; sponges; lint; trephines of two sizes—one to enable us to take out large portions of diseased bone, a smaller suited to a child's skull; perforator; brush; lenticular; raspatory; trepan forceps, a pair of small forceps, like those used for the teeth; the saws of Mr. Hey; two or three elevators; and two with finer points than generally used, for picking out the loose pieces.

The teeth of the trephine should be set, so as to make the cut wide, by which we are better able to ascertain our progress during the operation. There ought to be a relation betwixt the point of the elevators and the impression made by the trephine. An elevator with a reverted point will be found useful both in picking out loose pieces, and in retaining a loose bone under the motions of the trephine.

INTEGUMENTS.

Instead of scalping as they did formerly, we are careful to save the integument. The surgeon makes an incision upon the bone, and lays the flaps aside. Sometimes the way in which the integuments are cut by the accident will guide us how to make the incision: and we adapt our incision by making a triangular flap, or a semicircular cut, or raise and turn back the skin after making the cut in the form of a T. We ought to form the loose edge of our flap towards the ear, that matter may be the less liable to lodge, and that

it may gravitate towards the edge of the integuments: we should manage to avoid acute angles, for they shrink.

In making these incisions, the knife should not be held with a perpendicular edge, but somewhat obliquely, by which we avoid all danger of cutting upon a large rent in the skull, and penetrating it.

Unless the patient be very weak, there will be no occasion to take up the artery. But at the same time, if we be cutting low upon the temple, the vessels may bleed too profusely, and require to be tied.

PERICRANIUM.

From what has been delivered, we ought to be careful of the pericranium, and not lay the bone naked to a greater extent than may be necessary for the application of the trephine; for by doing so, we deprive the bone of its nourishing vessels.

When we are operating for large extravasations of blood below the skull, it has been observed that the surface of the bone does not bleed. It is therefore particularly of importance in cases of extravasation, where the dura mater, i. e. the internal periosteum, has been already separated, that we should as little as possible take away the pericranium, the external periosteum. The deficiency of blood, when we scrape off the membrane, ought to point out to us how we are endangering the intire loss of the supply of blood to the bone.

On the centre of that spot where we are to

apply the trephine, the perforator is placed, and a hole made, in which the centre pin of the trephine is to turn, that the circular saw may be kept steady. The few first motions of the trephine are to be made with a slight hand, and as soon as the circle cut in the bone is deep enough to preserve the trephine in its place, the centre pin must be taken out or drawn deeper into the cylinder of the instrument. When we have passed the outer table, the saw grates more softly, with less jarring; the sawings are bloody; and the instrument requires frequent brushing. We are entering upon the meditullium or diploe, viz. the more vascular centre of the bone. We must again have recourse to our anatomy here: recollect the thinness of a young skull, where the diploe is not yet formed; how frequently in old people again no distinction of tables is to be perceived; and the inequalities of the internal surface of the bone; in short, we must proceed as if we had no softer centre to expect. We have especially to recollect, that the inner table is much thinner than the outer one.

If we are operating on a dry or dead bone, the sawings will be dry, and we have to observe if they get moist as we cut deeper; or if there be an offensive smell on the cellular texture of the bone being opened.

As the instrument may be supposed to approach the inner surface, it should be frequently withdrawn, and the point of a tooth-pick should be drawn round the circle in the bone, which sinking through any part that is entirely cut, gives us warning to incline

the handle of the instrument so that the saw shall press only on the uncut part of the bone. Through the whole of the operation, the pressure should be light, to cut the bone easily; but now it should be very slight indeed, for the bone may suddenly give way. There is a clumsy addition to the trephine, which is intended to prevent the instrument being plunged against the dura mater and injuring it; but the best mode of guarding against this, is to keep the point of the fore finger resting on the side of the instrument, and nearly touching the edge of the bone; if the weight of the hand should carry the trephine too abruptly through, the finger will be a guard upon the membranes of the brain.

It will often happen, that we cannot cut the whole circle of the bone through, without injuring the dura mater in some point. It will therefore be necessary sometimes to break up the piece before we have completed the perforation of the bone, in the whole circle.

The form of the forceps teaches their use; they are adapted to take hold of the circular piece of bone; the two small levers which I have mentioned may be used for the same purpose. Having taken out the circular piece of bone, perhaps the operation is finished; but if the trephine has been applied in order to raise a piece of depressed bone, we now take the elevator. We introduce the elevator under the depressed bone; but probably we find the bone jammed and fixed, or, though loose, yet as we raise it on this side, the other side presses down upon the dura mater. If this cannot

be prevented by the use of another lever*, the trepan must be again applied.

It is impossible to lay down in general rules where we are to plant the trephine, in order successfully to elevate the bone. But I will venture so far against the common rule, as to say, that if we can we ought to place it upon the bone, which we are to take away, if it will bear the necessary pressure without injuring the dura mater.

If A be a depressed piece of bone, quite below the level of the skull, it may happen that, owing to the shattered part G, A is loose, and it may be raised simply by the lever introduced at B. But if this should not succeed, and the bone should be too firmly fixed for this simpler operation, then the trephine is to be applied. The common directions

* I have used a lever with the point of a hook-like form. It passes under the edge of the firm bone, and catches hold of the edge of the loose piece, so as to keep it steady.

are such as would make us set it at [illegible]. But as by this means the whole space of the skull from E to D would be laid open, I would if possible apply it at F, upon that part of the bone which is to be taken away; and as the bone is firm and wedged here, I should do this with safety. I should expect that by taking out the circular portion F, I would be enabled to pick away the pieces, G, and thus open the fracture from F to E, and loosen the whole extent of the base of the depressed piece, by which it was held firm. But should this not be the case, then we might apply the trephine at D, on the sound bone.

But again, should A not be so far reduced below the level of the sound bone as to be free of the trephine (as indeed it seldom will be); should the edge of the depressed bone shelve under the firm bone, as it generally does, then we must keep free of its edge, or before the instrument has cut through we shall be pressing on the loose bone, and endangering the dura mater.

Let the surgeon remember, that in fracture with depression the inner table is always broken off to a greater extent than the area of the outer table, and that consequently if an intire piece is forced in, it cannot be withdrawn through the opening of the skull. We have therefore to consider in what direction, and how far the opening is to be enlarged.

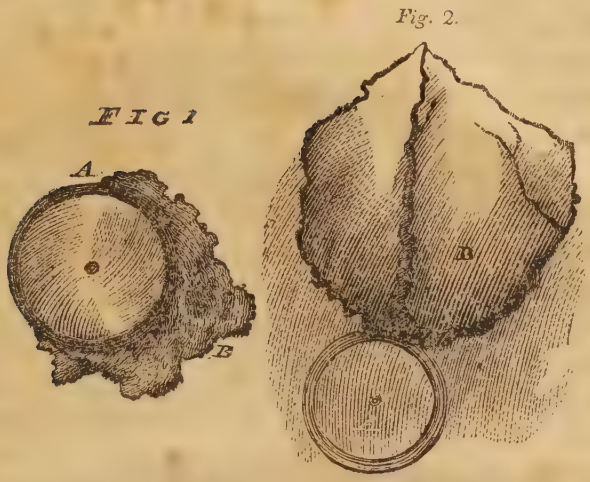
Suppose that the depressed bone is fixed as in

* Which if unavoidable in the use of the trephine, then indeed we must agree with Mr. Hey, and prefer the saw to the trephine.

(1), then we apply the perforator near the margin, and one half of the circular saw operates on the depressed portion, the other on the sound bone. The sound bone is loose before the other, in which case the object of the operation is accomplished; for by getting out the portion (2), the elevator or lever may be introduced under the depressed portion. If, however, the depressed portion have the inner table shelving under the outer one, although we can introduce the elevator into the trephine hole, and although we may raise the piece of bone to the level of the skull, yet we cannot bring it away. This is the reason of the necessity of applying the trephine at the opposite edge of the fractured portion, where the depression is less; for having opened the skull, there the spathula or lever can be introduced under the depressed bone, so as to withdraw it from under the edge of the outer table of the skull.

If it shall appear that in the end it may be necessary to fix a trephine on the insulated portion of bone, it is better to do it at first; because after a circular portion is taken out on the margin of the depressed bone, it may have become loose, and will no longer bear the pressure of the instrument upon it, although, owing to its shelving edges, it is still impossible to elevate the bone.

Sometimes the portion of the inner table under the trephine (where we are operating on the sound outer table) may be loose, and we may be working it against the dura mater long before the instrument has passed through at any one point.



For example, the portion A, fig. 1, has been included in the trephine; but when the instrument had cut through the outer table, the inner table, B, being loose and splintered off from the firm part of the skull, yielded to the pressure. Therefore, when we withdraw the saw occasionally, to clean it, we have to observe the degree of looseness of the bone.

Again, supposing that we have to operate at A, fig. 2, in order to elevate B, although the circle seems to be on the firm bone, yet we have to recollect that almost always, the lower table being very brittle, the inner table of the depressed portion is of more extent than the apparent field of the depressed portion B; and consequently, when we have cut through the outer table of A, we begin to depress and jar on the extremity of B.

The great nicety of performing the operation of trepan, consists in observing well, in the first place,

what point holds the bone firm; and whether the larger depressed piece may be brought through the opening of the skull, when we have perforated in this place or that.

The last advice I give relates to the use of the lever or elevators. Where there are lesser pieces which may be picked away, the operation of sawing may often, by raising these, be avoided; for the depressed piece may thus be entirely loosened, or we may then get the elevator so introduced as to raise the depressed bone. In my list of instruments, I have provided several of these elevators, and the meaning is, that they should be very seldom used singly; for unless the one side of the bone be held from sinking and being depressed, whilst the other is elevated, it will be pressed down so as to injure the parts beneath.

The lever may be used with advantage when the trephine is to be put on a piece of bone somewhat loose; for by that means the bone may be fixed and kept from jarring.

OF THE DRESSING AFTER THE OPERATION OF TREPAN.

Whether only the bone has been opened with the trephine, or more of the cranium has been taken away, we ought to look narrowly to the edges of the bone, and use the lenticular to take off all irregularities and sharp points, which may be likely to cut the dura mater.

The next object ought to be, to judge by the tenseness and convexity of the dura mater, if bleeding be necessary to subdue the fulness of the blood

vessels of the brain. We shall be assisted in our judgment, by observing the countenance, breathing, and pulse.

In the treatment of the wound, we should wish to apply the mildest and softest dressings, as such might promote a good suppuration; but there is an indication of the first importance, which is best announced, by stating, that in a violent fit of coughing, the dura mater has been burst by the brain forcing it against the edge of the bone; that it is very often ulcerated from the same cause; and lastly, that a portion of the brain has been forced through the wound in a fit of coughing. It is quite evident, therefore, that while we use the mildest dressings, the integuments should be put down upon the dura mater, and a compress and bandage applied, not so as to press, but so as to support the membranes of the brain. To the same effect, slips of oiled lint or of dressing must be laid upon the dura mater, when the integuments cannot be made use of for the purpose of supporting that membrane. The apparel of the head must be light, the cloths wetted, and the patient laid in bed with the head elevated. During the cure, let attention be paid to keep a free passage for the matter, that it does not work under the integuments, nor under the temporal fascia. The patient must be kept cool and quiet, in a well ventilated but dark chamber, and the utmost attention paid when threatened with acceleration of the circulation in the brain. Then we must bleed, and after opening the bowels, give an opiate joined with antimonial preparation.

OF THE FUNGUS CEREBRI.

I HAVE dissected only two cases* of that tumour called Fungus Cerebri, which rises from the perforation of the skull and dura mater. But the observations which I have made, and the opinion I have formed, are so different from those of my learned friend Mr. Abernethy, that I think myself called upon in some degree to extend the consideration of the subject.

Mr. Abernethy conceives that such tumours proceed from an injury of part of the brain, which has terminated in a diseased state of the blood-vessels, similar to what happens in apoplexy; and that the morbid state increasing, one or more vessels give way, and an effusion of blood into the substance of the brain ensues. He supposes, that if in this state of the brain there were no opening in the cranium, apoplexy would be the consequence; but that the deficiency of the bone allows the blood to expand and press the brain and its meninges through the vacant space of the bone; that the dura mater soon ulcerates; and that the tumour pushing through the opening, now increases with a rapidity proportionate to that with which the hæmorrhagy takes place within.

I have dissected a case very much resembling that described by Mr. Abernethy, in which the section of the brain around the root of the tumour shewed many spots of extravasation; and it would

* Since the former edition I have examined several cases; they have not induced me to alter my course of reasoning.

readily occur to any one, that this tumour had been occasioned by one of the larger vessels giving way, and pouring out a coagulum. But these spots of extravasated blood attend most ulcerations in the substance of the brain.

In the first place, I conceive that the deficiency of the skull, and the ulceration of the dura mater, always precede this disease; that it is in consequence of large openings in the skull by the trepan, or the lifting of large depressed pieces (accompanied by a tendency to ulceration in the substance of the brain,) that the pulsation of the brain forces the dura mater against the sharp edge of the bone, when it ulcerates; and then there quickly sprouts up this fungous tumour from the substance of the brain.

Mr. Abernethy conceives that the bursting of the vessel within the brain is a consequence of the blow; but I have seen the disease arise after a venereal caries of the skull, in which the whole thickness of the bone had exfoliated.

Further, the surface of this tumour bleeds when torn or cut. Not only it bleeds if it be torn off, but the abraded surface bleeds. This is not like a coagulum. 2. It shrinks and collapses upon death; which is certainly a mark of a part having circulation within it. 3. I have a preparation of this disease, where an ulcer passes from its base into the lateral ventricle, and where the ulcer communicated outwardly, and yet no drop of blood or coagulum was seen upon the surface of the brain, or in the cavities. 4. It is not formed of concentric lamina,

as the coagulum of an aneurism is. The blood never bursts from its surface, as it would do even from a venous tumour, which had power in the first instance to burst the membranes of the brain. It is affected like spongy granulation by caustic. A degree of compression, equal to the compression of a considerable artery, will not subdue it when its growth has got head. 5. It has a fibrous structure; and when it is dissolved in death, it hangs in shreds not like a coagulum. Lastly, the peculiar disposition to this disease is not shown merely in the tumour, but is evident on the margin and inner-side of the ulcerated cavity.

It is for these reasons that I venture to differ in opinion with Mr. Abernethy, for whose accuracy of observation and abilities I have great respect, heightened by friendship, and a sense of the great improvement I have reaped from his conversation, and from his works.

When a large portion of the cranium has been taken away, either by caries or the trepan, or when the trephine has been used, and the dura mater hurt by the teeth of the saw; or, lastly, when the edge of the skull has been left sharp and ragged—then, by the pulsation of the brain, which forces the dura mater upon the edges of the opening, that membrane is in part cut, in part ulcerated. At this place the support which is natural to the brain, is taken away, and the diseased part of the brain, and the ulcer which was forming, sends out a loose fungus; perhaps in some instances, part of the brain itself is in the first instance protruded. Whilst the tumour

rises outwardly, there is proceeding at the same time an ulceration into the substance of the brain.

Very soon after the separation of the bone, and the ulceration of the dura mater, the protrusion begins. In the commencement, and daily during the continuance of sensibility, the patient complains of a cold shivering, and pain in the head; his countenance is of a pale, dirty, cadaverous yellow. As the tumour increases, he has frequent sickness, is giddy, and reels like a drunken man; the pulse becomes slow and weak; he betakes himself entirely to bed; can no longer sit up; becomes incoherent; he lies oppressed, and his pulse is a mere tremulous motion of the artery.

I have seen examples of the Fungus Cerebri from gun-shot wound of the skull, and the scene was very distressing. Of the men whom I saw returned from the battle of Corunna, three had the skull fractured and the dura mater torn; in these men the fungus tumour rose with the returning strength; for before their reception into the hospital all the patients from that expedition were exhausted in an unusul degree. This state of debility retarded the rising of the tumour of the brain in these three men: but at the period when the sick were recovering from their exhaustion, these men were falling into convulsions. The inflammation of the brain commencing, and the fungus tumour rising, the patient becomes delirious: at the same time the muscles of the face become convulsed: the eyeballs are fixed and squint: the teeth are grinding from the contractions of the muscles of the jaw: the lips are

retracted. The convulsion extends to the whole body, and there is perfect oposthotonos. I sketched the figure on the last page of the Section of Gunshot Wounds, from these three men, all of whom died with fungous excrescence from the brain.

The tumour should be cut freely off; and after this there should be slight and equable pressure. The pressure and growth of the fungus keeps up high vascular action in all that part of the brain to which it is attached; as in other instances the cutting off an excrescence from a tumour checks the activity of vessels, so I conceive it will do here, and it will also allow the matter commonly formed behind it to escape. When nature performs a cure, it is by the fungus being choaked, and dropping off, either in consequence of its own rapid increase, or in consequence of the growth of the granulations of the scalp and bones.

When I say that the tumour should be cut off, I should more fully express that pressure is absolutely necessary. The pressure should be such as will prevent the rising of the tumour rather than for the purpose of compressing it, and forcing it within the skull. The more rapid growth of the tumour being a consequence of the encrease of the velocity of the circulation, points out another mode of preventing its encrease, viz. by bleeding in proportion as the pulsation of the brain is strong.

END OF THE FIRST VOLUME.